Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

APRIL 1956

One of Five Specialized Railway Age Publications

formerly Railway Mechanical and Electrical Engineer

Mechanical Reefer Controls

What Type Air Filter?

ICC Safety Regulations

Alco Simplifies Loco. Control

CORRELATED UNITS MAKE HOPPERS

Structurally sound..

Your best STANDARD assembly..

All cast steel!

WINE

Hopper Frames, Adjustable Locks and Hinges

THE WINE RAILWAY APPLIANCE CO., TOLEDO 9, OHIO

HOW MANY STEPS IN THE LIFE OF A BRAKE BEAM?

The railroads use millions of time-consuming, money-wasting steps each year carrying freight car brake beams into reclamation plants for dismantling and reassembling—then back again to the stores department.

Truslock cuts the number of those steps right in half!

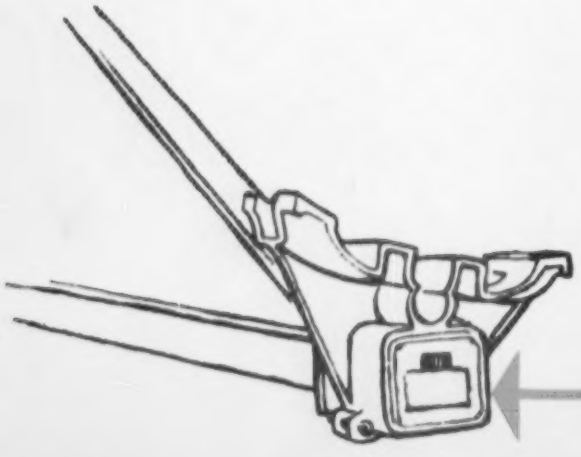
Here's why—

Worn or damaged brake heads account for at least half of the brake beams coming into reclamation plants. It stands to reason that a brake beam equipped with a quick-change brake head—replaceable in a jiffy without special tools or the need to disassemble the brake beam—will cut your reclamation costs by fifty percent.

Economical maintenance is only one of the many TRUSLOCK features that have sold this premium brake beam to 72 railroads and private car lines.

YOUR FIRST BRAKE HEAD CHANGE ON A TRUSLOCK WILL SAVE YOU MORE THAN THE SMALL PREMIUM YOU PAY FOR THIS TOP-PERFORMANCE BRAKE BEAM . . . MAKES TRUSLOCK THE LOWEST COST NO. 18 BRAKE BEAM YOU CAN BUY.

BUFFALO BRAKE BEAM COMPANY
NEW YORK • BUFFALO



TRUSLOCK

The Buffalo Brake Beam with the Quick-Change Brake Head

Oakite gives you the IMPORTANT advantage...

LOW-COST END RESULTS

FOR EXAMPLE: *one railroad saves $4,141 a year on cleaning diesel engine parts*

What's the best way to figure the cost of a cleaning compound? Not always by price per pound. That can mislead you. It's the *END RESULTS* that give you your true cost picture.

Here's how one cost-conscious road proved this point—and to the tune of over $4,100 savings in a year. Shop now uses Oakite Composition No. 24 to tank-clean diesel heads, liners, pistons (not aluminum), rocker arms, connecting rods, etc. As you see, the few cents more per pound mean nothing compared to the *END RESULTS.*

	Initial Cost per lb.	Solution used	No. of lbs. required to run tank for one year	Total material cost for one year
Cheaper Cleaner	.055	12.5 oz/gal.	132,300	$7,276.50
Oakite Cleaner	.1265	8 oz/gal.	24,780	3,134.67

RAILROAD SAVES $4,141.83

Note, too, that after initial charge and with only minimum upkeep Oakite Composition No. 24 lasts a full year, whereas the low-price cleaner was dumped approximately every 2 months.

Here again is actual proof that Oakite gives you the IMPORTANT advantage... LOW-COST *END RESULTS.*

Time-saving, money-saving Oakite materials and methods described in 56-page Booklet. For your copy write Oakite Products, Inc., 46 Rector Street, New York 6, New York.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE®
MATERIALS · METHODS · SERVICE
SCIENCE

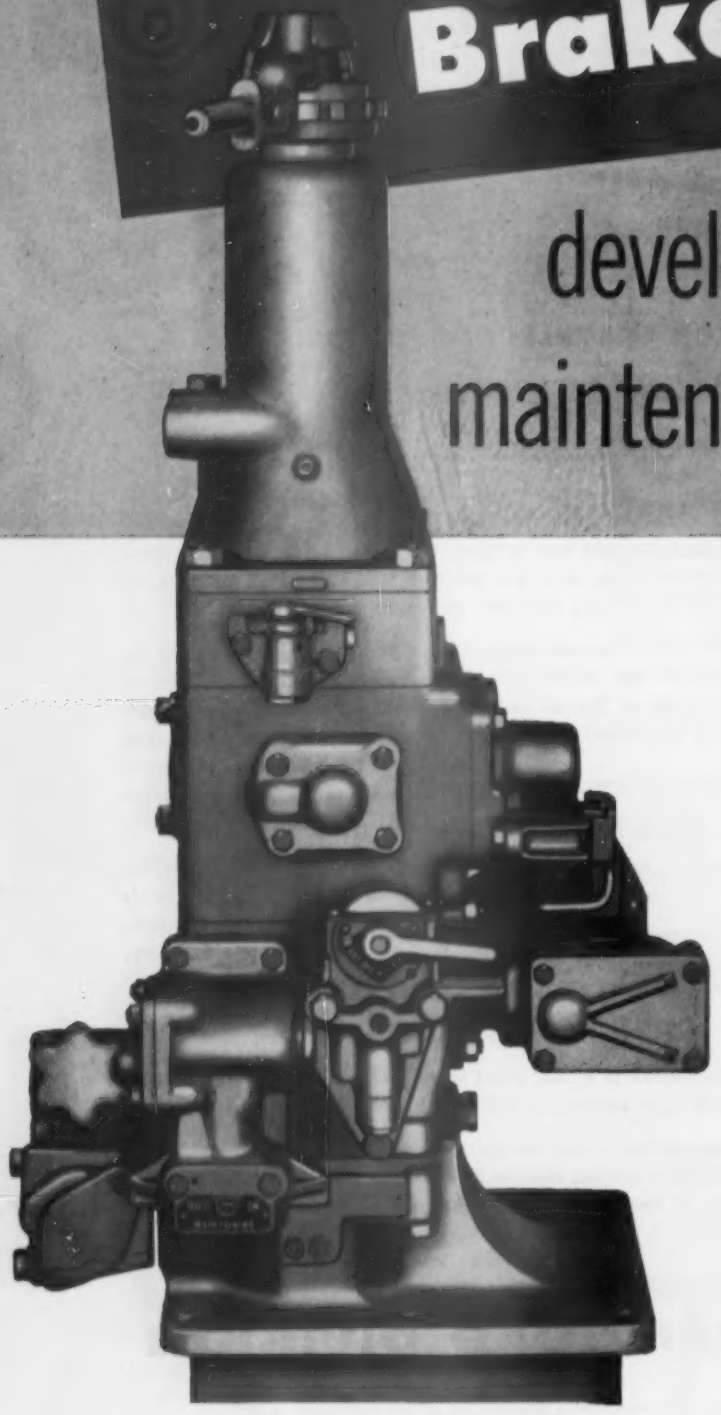
RAILROAD DIVISION

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

DS-24-M Brake Valve

develops outstanding maintenance economies



THE Brake Pipe Pressure Maintaining Feature provides more uniform distribution of braking throughout the train. It develops these outstanding maintenance economies—

1. Less rigging maintenance and fewer damaged brake heads.
2. More uniform brake shoe wear.
3. Reduced wheel damage from overheating at front end of train.

These economies can be realized on 24-RL Brake Valves now in service by substituting a Conversion Filling Piece for the existing filling piece.

Write for our Circular Notice No. 1130 which gives complete details.

Westinghouse Air Brake COMPANY

AIR BRAKE DIVISION WILMERDING, PENNA.

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Founded in 1832 as the American Rail-Road Journal

APRIL, 1956 VOLUME 130, No. 4

EDITORIALS 41

MOTIVE POWER AND CAR:

What Type Air Filter? 45
How Temperature Controls Work in Mechanical Refrigerator Cars 50
ICC Safety Regulations 54
Car Loading— Some things You can and Cannot Do 56

IDEAS FOR THE DIESEL REPAIR MAN 57

ELECTRICAL SECTION:

Alco Simplifies Its Locomotive Control 60
More About D-C Hi-Potting 65
Union RR Shop Prolongs Battery Life 69

DEPARTMENTS:

Equipment . . New Ideas—New Uses 6
News 18
Personal Mention 18
Supply Trade Notes 22
New Books 43
Letters to the Editor 43
Problem Page 70
Questions and Answers 72
Index to Advertisers 116

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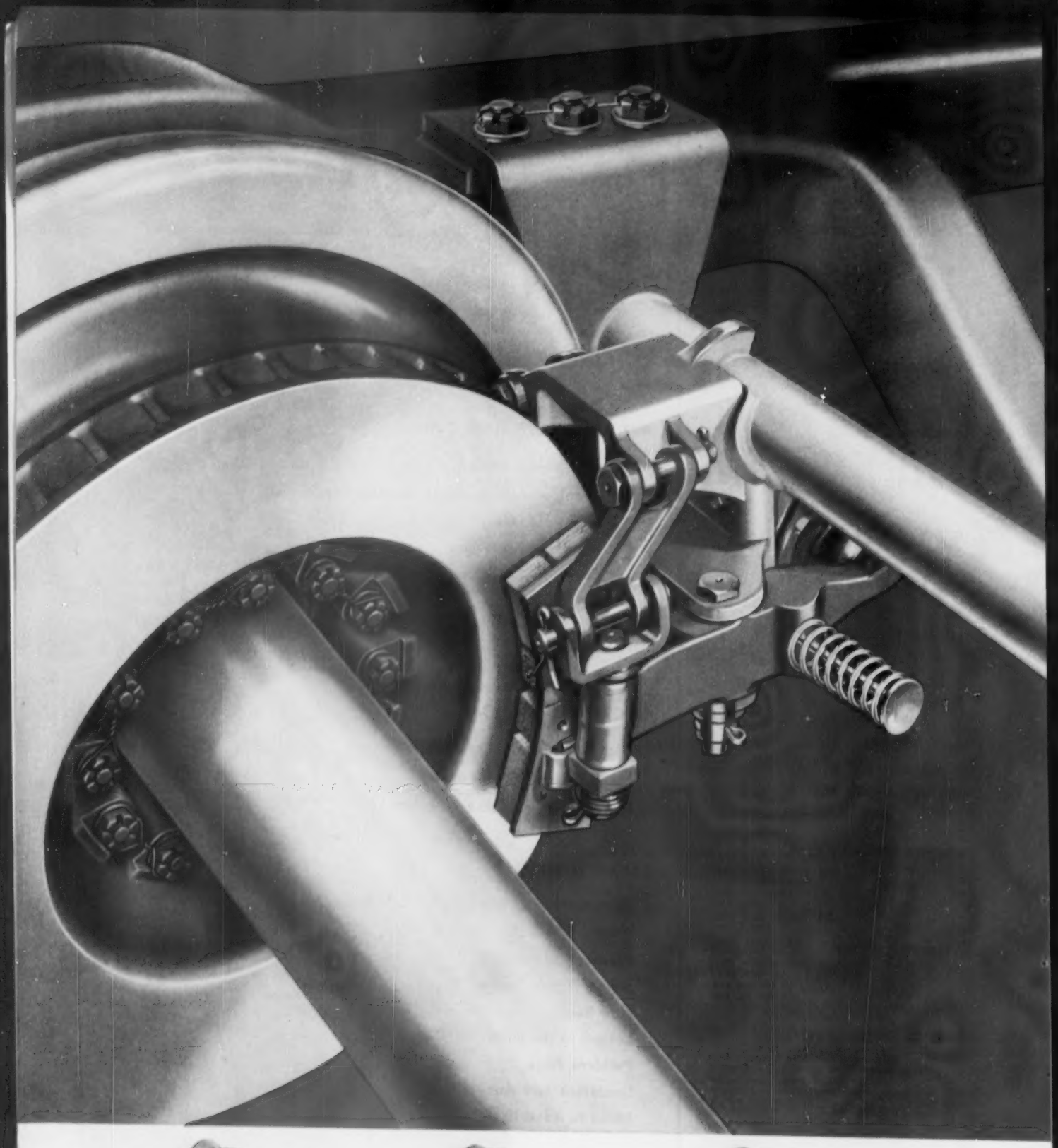
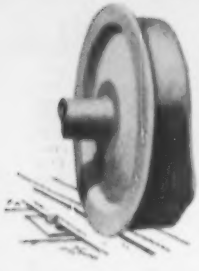
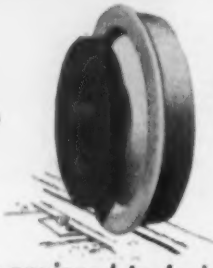
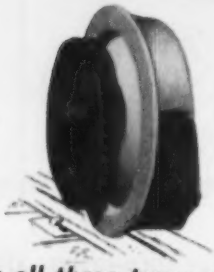




Clasp...



Rotor...



Combination

Only ASF is equipped to design and develop all three types of brakes

Point by Point...

check this ASF Brake for safe, economical stopping power

Simple design saves money on maintenance

All working parts of the ASF-Simplex Rotor Brake are easily accessible for quick inspection—without removal from the truck. To change shoes, simply remove one pin and lift out head assembly. Shoes are riveted type; replacement is easy without special tools or fixtures. And, *it's virtually impossible to make a mistake when reassembling the head.* Just slip in the simple pin and cotter, and the brake head is locked in place positively and safely.

Full-floating suspension insulates against shock

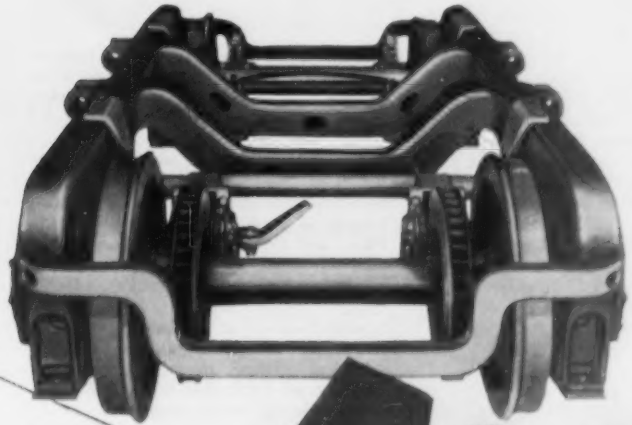
Note the unique mounting of the entire Simplex Rotor Brake assembly—*100% spring suspended.* This lengthens life of all parts. The spring suspension is not "short-circuited" by attachment to journal boxes. Thus, wheels and axles are easier to remove without interference.

Safe, dependable stopping power ... always

Brake shoes are positively guided to make them parallel with rotor; no binding to cause improper action. Power is supplied by rigidly mounted, double-acting cylinders. Shoes have extra thickness ... adding many miles of wear between changes. And, these shoes were selected after years of dynamometer testing as the best composition for uniform torque at all speeds and under all weather conditions.

Proved in tests ... proved in service

The ASF-Simplex Rotor Brake has been subjected to exhaustive laboratory and field tests—and proved by millions of car miles of service. Nothing has been spared in making this brake live up to the high standards implied by the name "Simplex." Pins are induction-hardened for maximum wear ... hardened bushings are ground to close tolerances for smooth operation. And, *the quality of this brake is backed by the prompt service that only a multi-million-dollar plant investment and a multi-million-dollar parts stock can truly produce.*

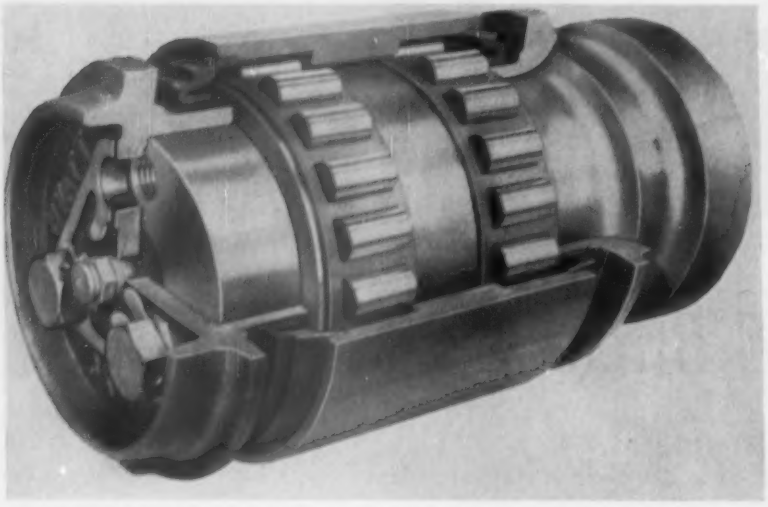


ASF

AMERICAN STEEL FOUNDRIES

Prudential Plaza, Chicago 1, Illinois

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec



Locking cap (left) is retained on the end of the axle with three cap screws. Front grease seal fits inside the housing and rides on the locking cap. Inner races for the two sets of rollers are separated by a spacer and positioned on the axle by the dust guard at the far right. Rear grease seal fits inside the housing and rides on the dust guard. Housing for the bearing also serves as the outer race. Grease is applied through the opening at the center of the locking cap. Application to the axle is done with a wheel press or with a special jack supplied by the manufacturer.

Roller Bearing

The Hyatt Hy-Roll roller bearing has been designed to fit all AAR standard freight car trucks. With adapters, the box may be applied either to pedestal or integral housing type side frames. The integral box type requires modification. Both styles use the same bearing package. A special wedge is required for application to the integral box side frame and to the *narrow jaw* pedestal type side frame. A frame adapter is needed to fit the bearing to a pedestal type side frame. Hyatt wedges and adapters are interchangeable with all other makes, size for size.

Combined radial and thrust loads are carried by the two rows of cylindrical rollers. Thrust loads are absorbed by the external flanges of the inner races and the internal flange of the outer race or housing which contact the opposite ends of the rollers. The Hyatt Hy-Roll bearing takes thrust in both directions.

The housing is a symmetrical forging of bearing quality alloy steel. The ends are counterbored and grooved to receive the grease seals which are pressed in place. The roller pathways and flange faces are ground to precision bearing accuracy. After finishing, the housing is surface treated to maintain bearing performance for the life of the box and to retard corrosion.

There are two identical single flange type inner races in each assembly. They are mounted so as to provide proper operating space for the rollers. Each race is a heavy cylinder made of bearing quality alloy steel, hardened and ground to close tolerances to provide proper fits, operating clearances, and interchangeability.

Each Hy-Roll journal bearing contains two rows of cylindrical rollers with flat ends which operate directly on the hardened and ground housing or outer race bore. The rollers are spaced and kept in alignment by one-piece separators. All rollers are made of bearing quality steel, properly heat-treated to provide a hard operating surface for resistance to wear and a ductile core to withstand the heavy shock loads usual in railroad service. They are ground to close limits to insure uniformity of diameter length, and squareness. The roller ends are surface treated to minimize wear. The rollers of each assembly are spaced and guided by one-piece steel separators. These are straight cylinders with uniformly pierced pockets.

The spacer ring is a hardened steel cylinder surface treated all over to minimize wear and resist corrosion. Its function is to assist in keeping the rollers properly aligned in operation and properly spaced laterally. The rollers of each assembly are spaced and guided by one piece steel separators. These are straight cylinders with uniformly pierced pockets.

The dust guard is also made from perlitic malleable iron, surface treated all over. It positions the inner races on the axle and provides a seat for the rear seal. It has a peripheral flange which serves to protect the seal. The Hy-Roll bearing is sealed, front and rear, with multiple lipped positive seals. These seals retain the lubricant and prevent foreign matter from entering the interior of the assembly. The lips of these seals are designed for very light contact with the sealing surfaces, insuring long life and a minimum of wear.

Each bearing assembly is secured to the axle with three cap screws securely anchored by the locking plate tabs. The tabs are so spaced that they are always in position to be bent against the heads of the screws. This locking device takes practically no time to apply and may be re-used.

Wedge permits the bearing to be applied to integral-box or narrow-pedestal side frames. Integral box type must be burned out at the back to make application.

Adapter allows wide pedestal side frame to be equipped with the bearing. Grease is the lubricant and manufacturer recommends lubrication on a three-year basis.

The wedge and frame adapter distribute the radial load and position the bearing with respect to the truck frame. The frame adapter is used in a pedestal type side frame and the wedge in an integral box type side frame and *narrow jaw* pedestal side frame. Both the wedge and the adapter may be drilled for heat indicators or furnished without, at the option of the user. Wedges and adapters are made from malleable iron surface treated all over, to guarantee proper functioning and to retard corrosion in use or in storage.

The bearing is produced in 5 x 9, 5-½ x 10, 6 x 11, and 6-½ x12-in. sizes. *Hyatt Bearings Division, General Motors Corp., Dept. RLC, Harrison, N. J.*

(Turn to page 10)

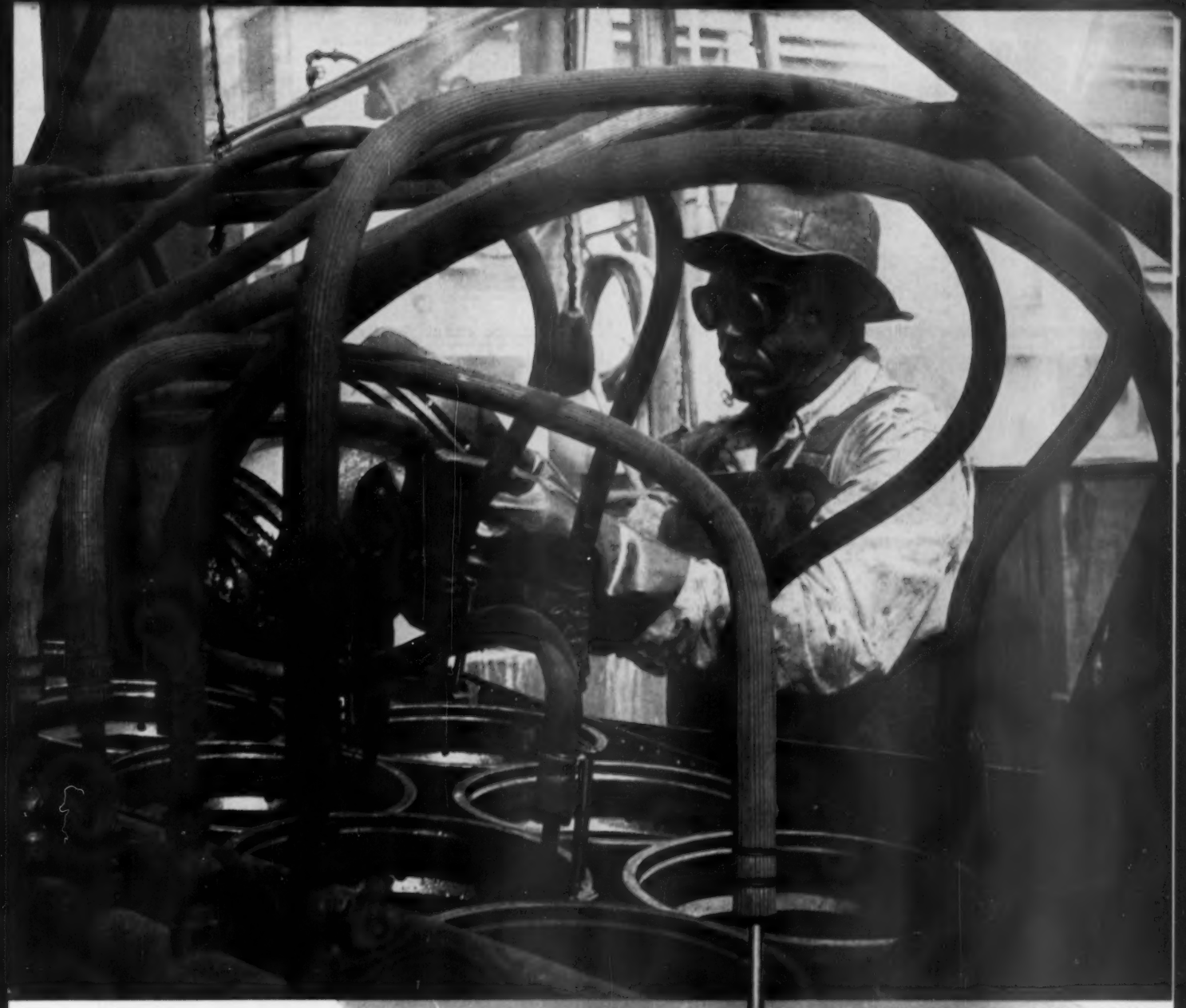


PHOTO COURTESY OF UNION PACIFIC RAILROAD

IT'S CLEANED...WITH **TRANSPO**...BY TURCO

Better Diesel aluminum piston cleaning...and cleaning other aluminum parts...in less time with complete safety is the unfailing result when Turco Transpo is used. Transpo, like other Turco compounds, was *developed especially* for railroads. It stands as a good example why, for any cleaning job...*railroad cleaning job* ...America's leading railroads...turn to Turco...*first!*

TURCO PRODUCTS, INC.
Chemical Processing Compounds

Railroad Division
6135 South Central Avenue
Los Angeles 1, California

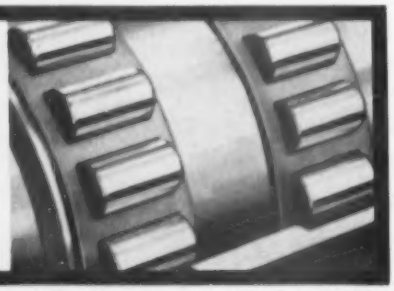
Factories: NEWARK • CHICAGO
HOUSTON • LOS ANGELES

4 key reasons why are switching to the

1

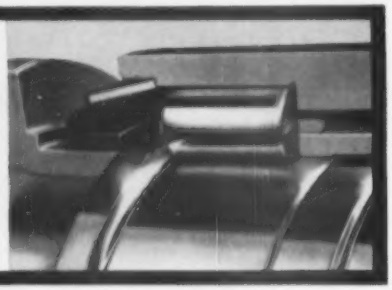
Simplified design assures lower installation costs. Only four parts on axle; all parts are interchangeable. No fitting adjustments.

2



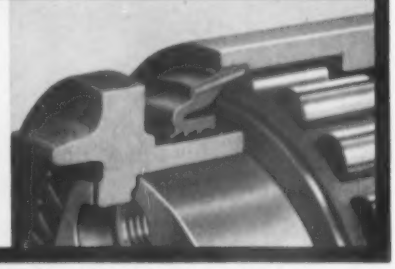
Big, husky straight cylindrical rollers, like those in all HYATT journal bearings, provide more load-carrying capacity, longer life.

3



Lateral thrusts are easily and efficiently absorbed by rugged oversize race flanges which locate and help guide the rollers.

4



Positive-type seals at both ends of the housing retain 3-year supply of lubricant, completely exclude dirt, water and foreign matter.

Here you see exactly *why* we say: The new HYATT Hy-Roll is so *simplified*, so *dependable*, so *economical* that it makes the big switch to roller bearing freight completely *practical* at last!

The Hy-Roll is the culmination of HYATT'S unequalled experience in building more roller bearings for American railroads than any other maker. Seventeen major lines have equipped thousands of freight cars with HYATTS in recent years; 40% of all modern passenger cars and 70% of all diesel road engines have HYATTS, too—every last one built with time-tested straight cylindrical rollers! The basic features of the new HYATT Hy-Roll have already been proved in millions of miles of high-speed service.

TOMORROW'S PROFITS DEPEND ON FORESIGHT TODAY

A freight car, unlike a highway truck, isn't worn out and replaced with a more modern model every few years. The fleets of freight cars being built today will still be rolling 10, 15 or 20 years from now. Be sure to equip your new cars with modern HYATT Hy-Roll Roller Bearings so they can return you maximum profit today and *remain competitive for years to come!* Call your HYATT Sales Engineer *now* — or write Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

MORE HYATT ROLLER BEARINGS ARE IN USE BY AMERICAN RAILROADS THAN ANY OTHER MAKE!

With the addition of a simple wedge or frame adapter, the HYATT Hy-Roll fits both integral and pedestal types of trucks.

ONE BEARING FITS BOTH!

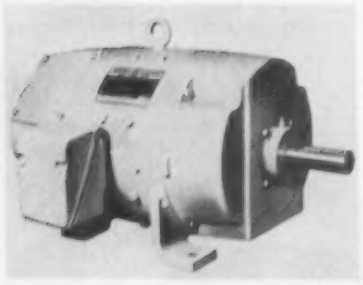
Another GM GENERAL MOTORS contribution to railroad prosperity

American railroads new HYATT HY-ROLL FOR FREIGHT CARS!

The revolutionary GM Aerotrains speed on straight cylindrical roller bearings built by HYATT.

HYATT

HY-ROLL BEARINGS FOR NON-STOP FREIGHT

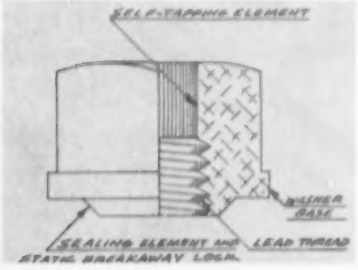


DC Motors and Generators

The Kinamatic line of direct current motors and generators has been designed to meet industrial requirements for faster, more continuous and more automatic production.

They are built to NEMA standards, and all motor ratings from 1 to 150 hp and generators from ⅝ to 100 kw are available. Speed is adjustable by armature voltage control, field strength control, or any combination of both. High base speeds are available and higher top speeds may be obtained by field strength adjustment. The motors can be operated at any speed below base, including stalled torque.

Full Class B insulation, a high volume fan and improved air flow enable the maker to guarantee a 15 per cent service factor in all standard dripproof motors. Brushes are easily accessible through large hand holes for maintenance. Split, cast iron, waterproof conduit boxes, in three sizes for each motor frame, provide ample room for wiring connections. Ball bearings are packed for life with a special lubricant which will last many years under normal conditions. *General Electric Company, Direct Current Motor and Generator Division, Dept. RLC, Erie, Pa.*

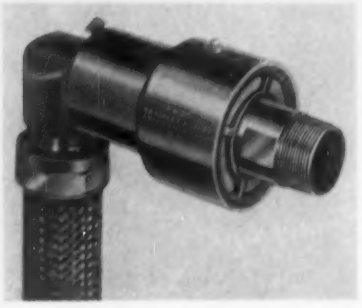


Nylon Stop Nut

The Brilok Nylon Stop Nut is a one-piece, washer-faced, resilient hexagon nut which is simultaneously self-tapping, locking and insulating. It is molded to American standard flat-widths dimensions for use with standard installation and removal tools.

This re-usable nut is said to be ideal for prosetting. Features include toughness, extreme light weight, resistance to corrosion, abrasion, vibration, impact, galling, seizing, conduction electrolysis and breakdown under strain.

The nut is stocked in natural nylon color, is available also in other colors for coding, circuit identification and ornamentation. It is manufactured in sizes number 4, 6, 8, 10, and ¼ in. *American Screw Company, Dept. RLC, Willimantic, Conn.*



Rotary Pressure Joint

This device of 1½ in. pipe size is a single-flow pressure joint, type PR 25, and is designed to carry and convey liquids or gases from a stationary pipe outlet to a revolving cylinder, drum, calender, dry can, etc.

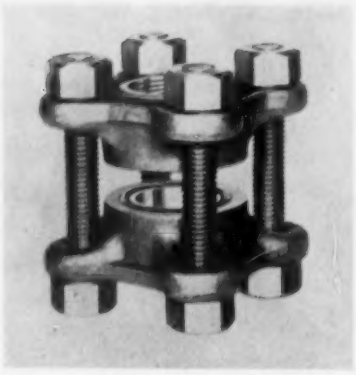
It is of heavier construction than previous models, and is equipped with two ball bearings to support and guide axially the revolving shaft, thus preventing misalignment and wobbling of shaft. This is said to insure continuous leakproof performance. The joint has a tamperproof metal seal and each unit is dated to determine length of service.

Other rotary joints are available in sizes from ⅜ in. to 2 in. I.P.S., in both syphon and single-flow types. *Seamlex Company, Dept. RLC, 41-23 24th street, Long Island City 1, N.Y.*

Industrial Paper Wipers

Disposable industrial paper wipers are now available in two sizes—No. 59, the original 9⅝-in. by 13⅝-in. two-ply sheets, and No. 58, 9⅝-in. by 10¼-in. two-ply sheets.

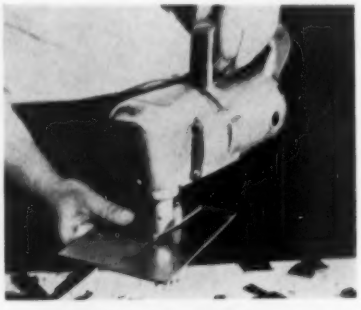
Both sizes are packaged in boxes of 125 wipers, with 18 boxes to a case. Each wiper consists of Perf-Embossed sheets, which are welded together for extra durability, giving thorough cleaning action and maximum dirt retention. Chemical treatment creates all-important wet strength. *Scott Paper Company, Dept. RLC, Chester, Pa.*



Flange Unions

Two-bolt and 4-bolt flange unions with O-Ring seals are for use in hydraulic equipment lines, process piping, water lines, refrigeration piping, etc. The O-Ring provides a tight seal against fluid pressure. The flanges are fabricated of high-strength forged steel with high-tensile studs.

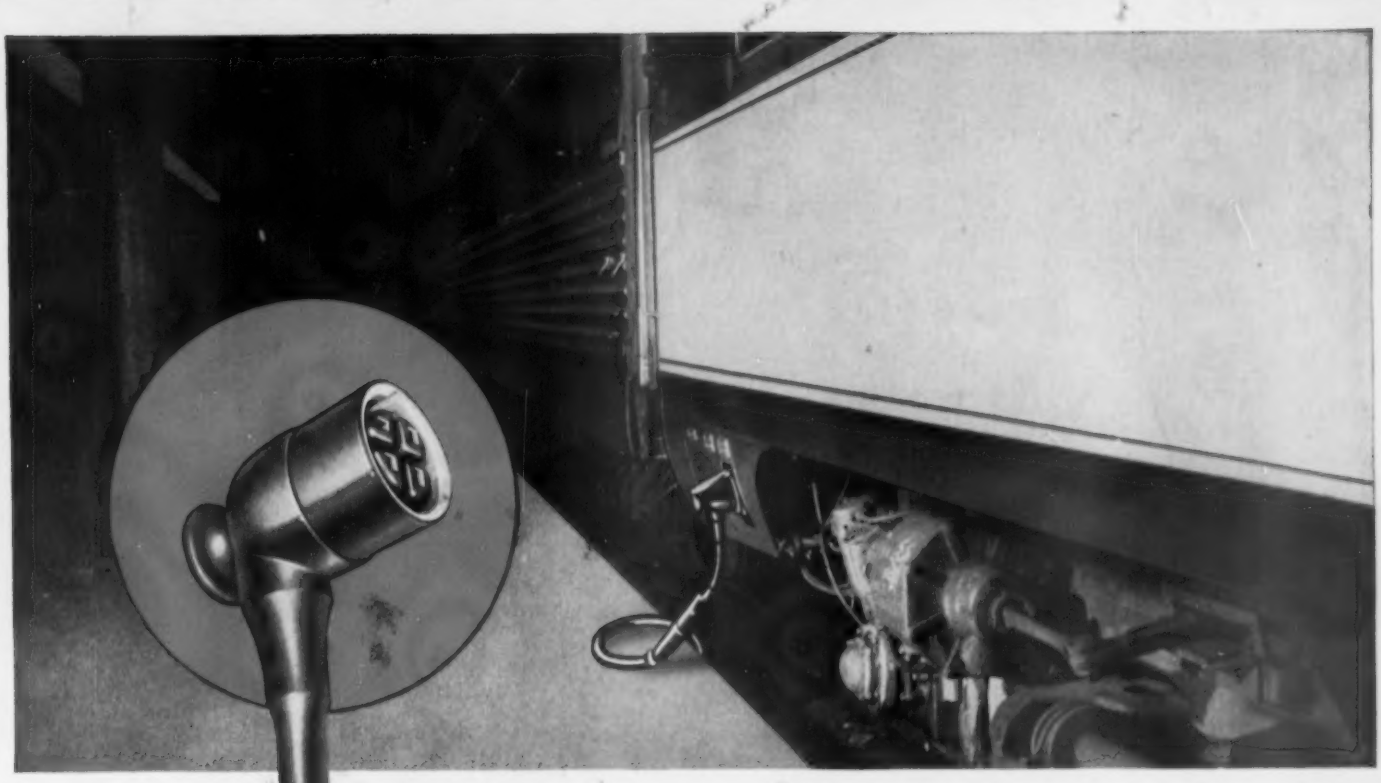
These unions are available in the 3,000-lb class both in screw-end and socket-welding types. The 2-bolt devices are made in sizes of ¾ in. to 1¼ in., while the 4-bolt unions are made in sizes of 1 in. to 2 in. The O-Rings are available in a variety of molded materials to resist a wide range of service conditions. *Watson-Stillman Fittings Division, H. K. Porter Company, Dept. RLC, P. O. Box 95, Roselle, N. J.*



Portable Nibbler

Precision cutting of heavy gage sheet metals, ferrous and non-ferrous, is claimed for this portable Nibbler. The unit, Model HN, is rated to handle stainless steel of all gages up to 10; milder steels and non-ferrous metals, up to 8 gage. It will cut contoured or corrugated stock and has a minimum cutting radius of 6 in.

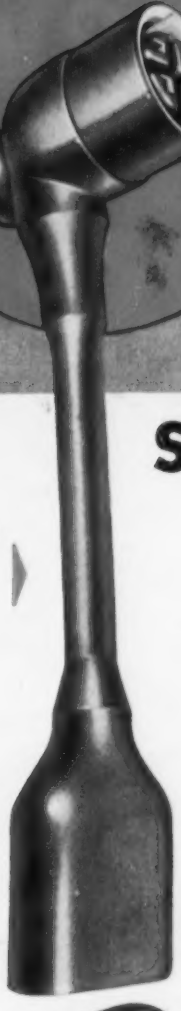
Cutting action is provided by a high speed punch and die which takes a ¼ in. cut of metal with each stroke. Speed at full load is 600 strokes per minute. The



STOP LOOK AND BUY JOY PLUGS

FOR DEPENDABLE A.C. STAND-BY SERVICE

RIGHT-ANGLE DESIGN JUMPER with MALE MOLDED-TO-CABLE "SNAP-OUT" PLUG.



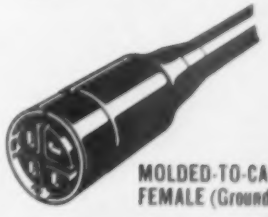
. . . There's a JOY plug and receptacle for every electrical connecting need in railway Stand-by air-conditioning circuits. Plug designs *illustrated at right* are available with or without ground. Right angle designs (left) are all grounded. Carefully designed to meet the most exacting railway requirements, these one-piece molded Neoprene connectors have never been surpassed for long-range, trouble-free service. Shatter-proof, moisture-tight, and wear resistant — they cannot crack and will not distort under normal, accidental impacts.

ATTACHABLE FEMALE PLUG (Ungrounded)

Choice of three designs

FOR 3 TYPES OF INSTALLATION

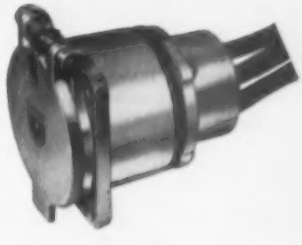
- **ATTACHABLE DESIGN . . . Equipped with screw type wiring terminals. Attach to user's cable.**
- **MOLDED-TO-CABLE DESIGN . . . Supplied on 36" long cable leads for splicing to user's own cable.**
- **COMPLETE ASSEMBLY . . . Factory molded to cable size & lengths as specified by user.**



MOLDED-TO-CABLE FEMALE (Grounded)

JOY A.C. RECEPTACLES

Have replaceable one-piece molded Neoprene/rubber inserts with insulated pigtail style wiring leads and sturdy aluminum mounting shells with self-closing, gasketed covers. Choice of flush mounting (illus.) or swiveling designs.



SNAP-OUT PLUGS

Protect expensive equipment and cable by automatically separating when train moves before disconnects are made. Choice of attachable or molded-to-cable female plugs. Male plugs supplied only in molded to cable design.

IMPORTANT:
Contacts are replaceable, in all JOY female A. C. plugs.

JOY

JOY MANUFACTURING COMPANY

HENRY W. OLIVER BUILDING, PITTSBURGH 22, PENNSYLVANIA

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LTD., GALT, ONTARIO

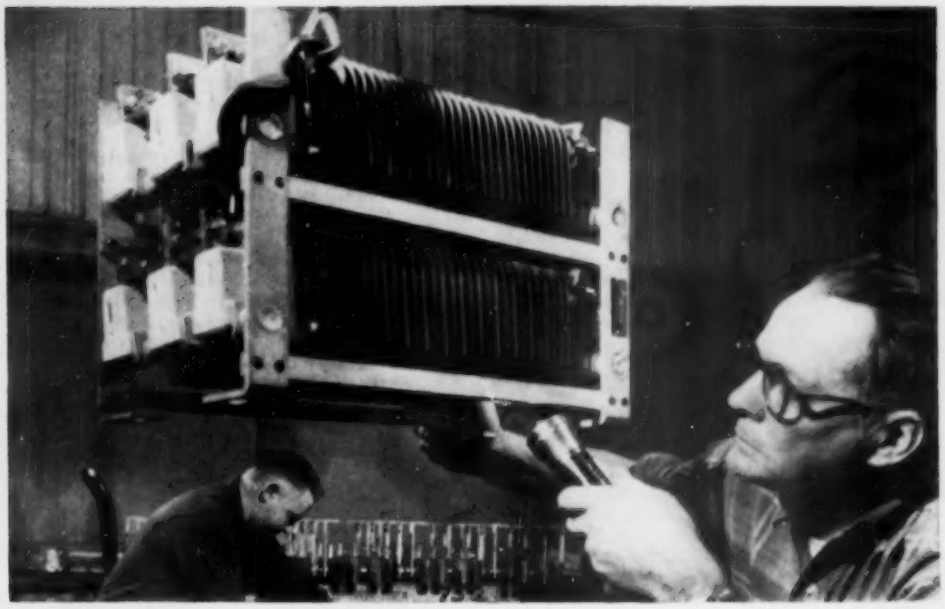
CD 298.9

2. G-E RECOMMENDED CARBON BRUSHES are selected for the proper degree of hardness and grain structure to minimize wear and tear on commutator surfaces of your unit.

3. G-E GEARING is designed and quality-control manufactured to carry the heavy starting loads and take the running shock loads encountered in today's heavy railroad service.

4. G-E COMMUTATORS retain smoothness in rigorous service because high-speed, high-temperature seasoning process sets segments firmly in place, cuts down friction wear and tear.

7 G-E replacement parts for better locomotive operation



1. G-E RESISTORS are tested and inspected during all phases of manufacture to assure you of top quality. Combination of manufacturing skill and experience makes G-E resistors your best replacement buy.

How G.E. Designs and Builds Resistors to Give You Maximum Service Life

Locomotive resistors are only as good as the care and precision that has gone into their manufacture. That's why General Electric's EWF resistors are your best buy when you need replacements for your locomotives. They're carefully designed and built to meet the demands of today's heavy service.

As an example, G.E. uses sturdy, lightweight, ceramic end supports that give exceptionally good insulation between units and to ground. What's more, they stand up under shock and vibration.

In addition, the edgewise-wound, steel-alloy ribbons on G-E resistors pack more kilowatt capacity into a smaller space, assure ample ventilation; and they, too, will endure severe service shocks.

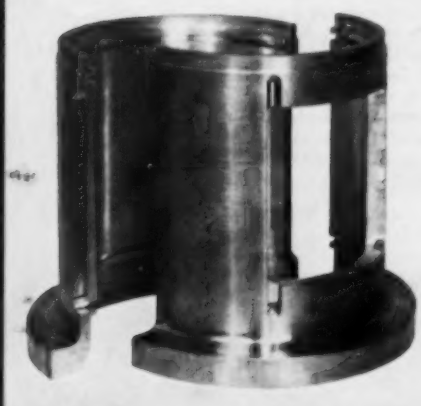
Most important, G-E resistors have a floating steel backbone that expands and contracts freely with high-temperature changes, thus nullifying the effect of harmful buckling forces.

For all these reasons, you should always specify genuine EWF resistors by General Electric when you need replacements. General Electric Co., Locomotive & Car Equipment Dept., Erie, Pa. 128-16

Progress Is Our Most Important Product

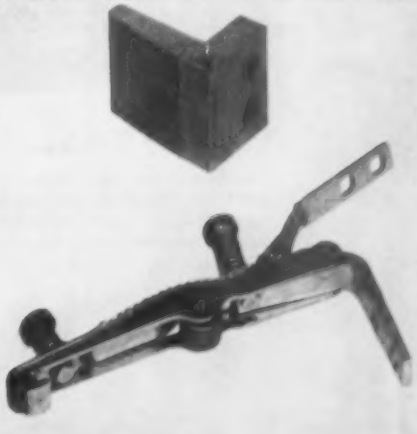
GENERAL ELECTRIC

5. G-E MOTOR SUSPENSION BEARINGS give you longer service life—have a built-in *oil-return* feature which can save up to $85.00 of operating costs per locomotive unit, each year.



6. G-E ARMATURE COILS are available as part of complete rewind kits for your convenience. Every coil is dimensionally accurate and quality insulated for longer life.

7. G-E CONTACT PARTS break circuits quickly with a minimum metal transfer. This assures you of long service life from these parts.



punch and die are removable and may be resharpened or replaced as necessary. Its motor is rated 1 hp and is of the universal type with a 3-wire, 9 ft rubber cord. Also available, as optional equipment, is a ground fuse cap and fuse for automatic protection. *Fenway Machine Company, Edgemont and Clementine streets, Dept. RLC, Philadelphia 34.*

Self-Forming Packing

This packing, which is self-forming and self-lubricating, has been developed to meet the needs of an entire plant and is said to offer a solution to the problem of stocking a number of different sizes, shapes and types of packings. One size will make itself into a solid, lead-like, leak-proof seal, the size and shape of any pump stuffing box or fitting. It is manufactured in two formulations, each available in coil or spiral form, or shredded or bulk form. *Flexrock Company, Packing Division, Dept. RLC, 3602-0 Filbert Street, Philadelphia 1.*

Portable Welder

The Model MF unit, designed for manganese steel and hardfacing work on irregularly-shaped parts, is mounted on industrial casters, and plugs into conventional ac or dc welding units by a single cable. It operates on a current range of from 150 to 450 amps.

As an accessory, the device serves as a semi-automatic unit for feeding flux-coated welding wire to parts of machines, being retreated with new metal after original surfaces have worn away. Special to the unit is a conical hopper mounted directly above the welding wire outlet as a means of storing and feeding flux. This flux adheres to the wire by a magnetic field created by the welding current, and each one-quart refill serves for 15 min of welding.

In operation, the MF welder produces a visible arc which fuses metal and flux upon the metal being welded or built up. Fluxes available include manganese steel, martensitic iron or martensitic steel. The unit makes use of the arc's current potential to govern speed of a motor-driven wire-serving device. *Amsco Division, American Brake Shoe Company, Dept. RLC, 230 Park avenue, New York 17.*

Motor Driven Trolley

This lightweight, heavy duty single speed push botton controlled motor driven trolley, Series 700, has been designed for installation on electrically powered hoists having capacities of from 1,000 to 12,000 lb. It is available in a variety of traverse speeds ranging from 25 ft per min to 130 ft per min, depending on size and voltage requirements.

Features of the trolley include side plates of non-fracturing rolled steel plate, full crowned universal traverse wheels and heat-treated spur geared teeth. All models are adjustable to fit a wide range of I-beams. Driving mechanism consists of a 30-min rated squirrel cage motor having self lubricated roller bearings.

A magnetically interlocked 24-volt, four-button control station eliminates the possibility of damage should both UP and DOWN buttons be depressed simultaneously. Low voltage at the push button control station is an important safety feature. The motor trolley is available as a factory installed unit in combination with any model of the Series 700 electric hoists. *Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc., Dept. RLC, Muskegon, Mich.*

Automatic Process Control For Liquid Fuels

The Model MG-5 Automatic Process Control, designed to safeguard the handling of liquid fuels and flammable liquids, reduces exposures to static caused fires and explosions. It checks the adequacy of all grounds and/or bonding connections and, if unsatisfactory, automatically prevents all loading or transfer operations.

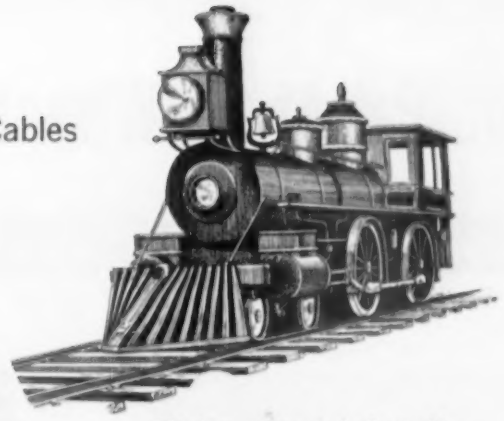
The complete unit is housed in an Underwriters' Laboratories approved explosion proof case. It is small, less than a foot cube, weighs 15 lb and is easy to install. *Hewson Company, Dept. RLC, 443 Broad street, Newark 2, N. J.*

Long Neck Weatherproof Lamps

High wattage, reflector type lamps with long necks, designed to fit old high bay or floodlight fixtures without mogul extension adapters, are made of weatherproof hard glass and are available in 300, 500 and 600 watt sizes for operation on standard and high voltages. Sealed-in silver reflectors require no cleaning to maintain rated light output. Nickel-plated brass bases with hard solder contacts eliminate freezing of lamps in sockets. *Radiant Lamp Corporation, Dept. RLC, 300 Jelliffe avenue, Newark 8, N. J.*

(*Turn to page 22*)

Electrical Wires and Cables



In step with America's Railroads ever since the single gauge came in...

This locomotive was the finest of its type back around 1890, the year "U. S." began making electrical wires and cables to serve the growing railroad industry.

Year by year, America's railroads become more and more dieselized and electrified. That steps up the demand for electrical wires and cables. But it also means that manufacturers have to turn out wires and cables of tougher specifications, greater durability, wider versatility. The tremendously complex centralized traffic control systems and other "push-button" devices need the finest wires and cables obtainable.

United States Rubber is right in the middle of this tremendous railroad electrification growth. For 66 years "U. S." has been supplying railroads with the wires and cables required—as well as *anticipating* future demands. "U. S." has gone along side by side with the railroads, as they grow into an ever stronger national transportation system—a system unmatched in economy, efficiency and safety.

"U. S." is the only wire and cable manufacturer growing its own natural rubber, making its own synthetic and plastic compounds. Through this unequaled *control of manufacture*, "U. S." can always guarantee *superior insulation* in every type of wire and cable it produces.

Electrical Wire & Cable Department, U. S. Rubber, Rockefeller Center, New York 20, N. Y.

Above is the United States Rubber wire and cable factory in 1890. Below (left) as it looks today.

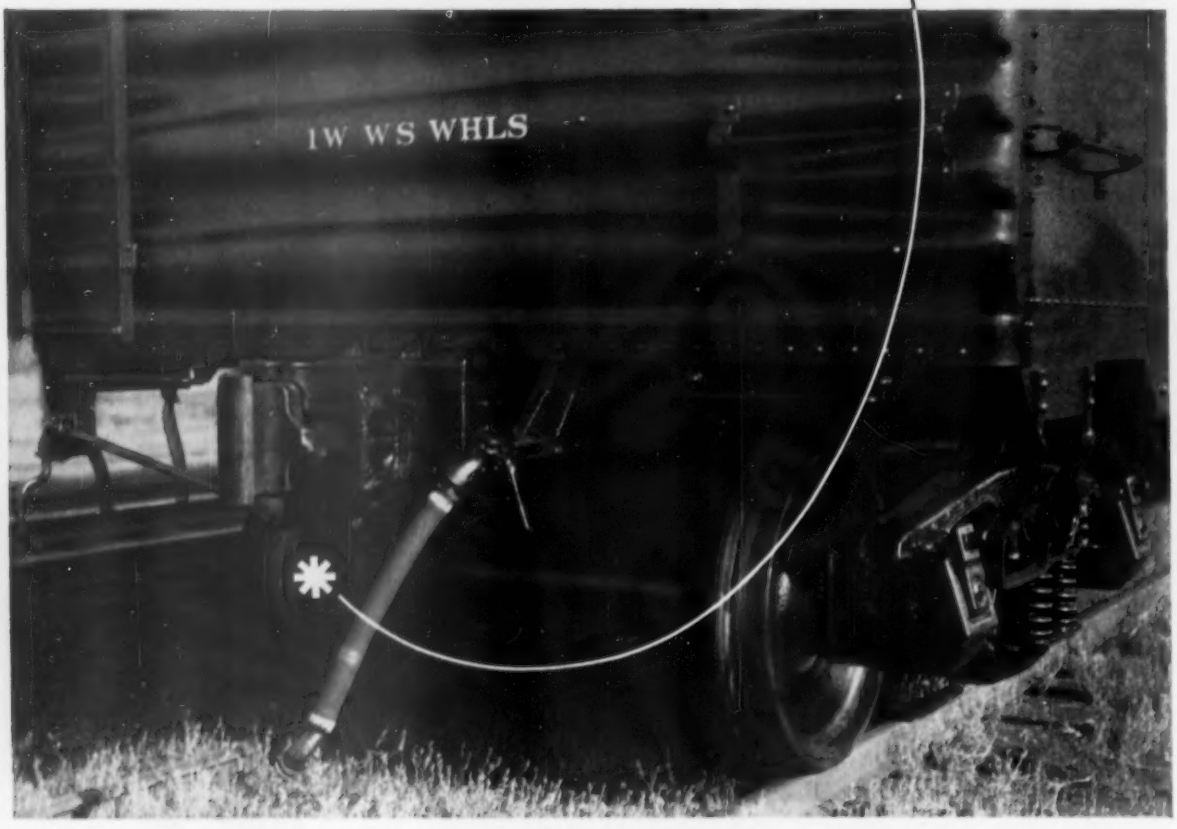
Just as this up-to-the-minute Diesel typifies the advancement in locomotion, so also "U. S." electrical wires and cables typify leadership in their field, as they have for 66 years.

Electrical Wire & Cable Department

United States Rubber

For Proof of Wheel Service

Look Under Your Cars



Permanently stamped on the back of the rim of each Armco One-Wear Wrought Steel Wheel is the date the wheel was made. See for yourself how long and well these wheels have served. *Just look under your cars.*

Rugged wrought steel wheels can't be beat for miles of service per dollar because they have the wear-resistance and toughness possible *only* in a forged and rolled wheel. This extra durability means more car miles, faster freight schedules, more satisfied shippers.

For complete information about Armco Wrought Steel Wheels, just contact our nearest Sales Office or write us at the address below.

Plan Now to Attend the AAR Purchases and Stores Division Meeting in St. Louis, May 16-17-18.

ARMCO STEEL CORPORATION

1156 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

TWO READY-TO-RUN COMPRESSORS FOR

LOW-COST AIR POWER

IN YOUR SHOP

the PHE
- 75 and 100 hp packaged
- Opposed-piston balanced design

the XLE
- 125 to 250 hp packaged
- 300 and 350 hp with engine-type synchronous motor
- Thru-frame air flow

Why MODERN I-R DESIGN can reduce your air power costs and increase your production

Built tough for continuous full load, and refined for efficient performance at all loads.

Packaged, ready to run, each unit completely self-contained with crankshaft-mounted motor. Units up to 250 hp are shipped fully assembled, ready to hook up.

Full-floating aluminum bearings are foolproof, never need adjustment. They "roll with the punch" of every compressor stroke. Wear is distributed evenly around both inside and outside.

Closed crankcase never has to be opened for bearing adjustment, so dirt (the major cause of wear) is kept out of the oil.

Two-stage, intercooled compression, with I-R cylinders of proven design, makes most efficient use of horsepower.

Exceptionally smooth running balance permits small, simple foundation.

Compactness permits installation in small areas, requiring less of your valuable shop space.

CHANNEL VALVES give quiet, trouble-free operation and amazing long life due to air-cushioned action and reversible seat plates. Known all over the world for their efficiency, these valves are entirely different in design and principle from any other valve ever used. Channel valves are available only in I-R compressors.

Ingersoll-Rand

1-381 **11 Broadway New York 4, N. Y.**

COMPRESSORS · CONDENSERS · AIR AND ELECTRIC TOOLS · TURBO-BLOWERS · PUMPS ROCK DRILLS · GAS AND DIESEL ENGINES

NEWS

Coordinated Assns. To Meet in September

The Coordinated Mechanical Associations—Air Brake, Car Department Officers', Locomotive Maintenance Officers', and Railway Fuel and Traveling Engineers' Associations—will hold a meeting, without exhibits, September 10, 11 and 12, at the Hotel Sherman, Chicago.

J. M. Hall Dies

JOHN M. HALL, who retired in 1949 as director of locomotive inspection, Interstate Commerce Commission, died March 8 in Washington, D. C., after a long illness. Mr. Hall was in his 77th year.

ORDERS AND INQUIRIES PLACED SINCE THE CLOSING OF THE MARCH ISSUE

FREIGHT-CAR ORDERS

Road and builder	*No. of cars*	*Type of car*	*Cap., tons*	*Other detail*
BALTIMORE & OHIO:				
Pullman-Standard	200	Cov. hopper	70	Approximate cost $1,700,000. Deliveries starting November.
BOSTON & MAINE:				
Pullman-Standard (Ordered through Piggy-Back, Inc.)	50	Flat	..	Late summer delivery.
NORTH AMERICAN CAR CORP.:				
Pullman-Standard	25	Cov. hopper	70	Approximate unit cost, $8,100. December delivery.
NORTHERN PACIFIC:				
General American	14	Cov. hopper	..	Air slide cars. Estimated unit cost, $12,515. Delivered in March.

PASSENGER-CAR ORDERS

Road and builder	*No. of cars*	*Type of car*	*Other detail*
CANADIAN PACIFIC:			
Budd Company	2	RDC-1	.....
	7	RDC-2	.....
	2	RDC-4	.....
	1	RDC-3	.....
CHICAGO, ROCK ISLAND & PACIFIC:			
Budd Company	2	RDC-3	Approximate cost $170,000 each. May delivery.
PACIFIC GREAT EASTERN:			
Budd Company	3	RDC-1	90-passenger.
	4	RDC-3	49-passenger, with baggage-mail compartments, and galleys for preparing and serving light meals.

INQUIRIES AND NOTES

FREIGHT CARS:
New York Central—The NYC has ordered 40 gondola-car covers from Republic Steel Corporation.
New York, Chicago & St. Louis.—The Nickel Plate has ordered 144 specially designed gondola-car covers from the Pressed Steel Division of Republic Steel Corporation to protect coiled steel freight in transit.

PERSONAL MENTION

Atchison, Topeka & Santa Fe

O. H. BARKER, coach shop foreman, appointed superintendent of the car department at Cleburne, Tex.

J. L. FERTIG, division foreman at Calwa, Cal., appointed master mechanic at Galveston, Tex.

Baltimore & Ohio

EUGENE J. KERR appointed manager—technical development, Research and Development Department.

Canadian Pacific

E. G. BOWIE, superintendent of motive power and car department at Winnipeg, Man., retired.

T. F. DONALD, assistant superintendent motive power, appointed superintendent of motive power and car department. Headquarters, Winnipeg, Man.

W. STEWART, assistant to superintendent motive power, appointed assistant superintendent of motive power. Headquarters, Calgary.

Central of Georgia

R. L. GNANN, JR., appointed chief chemist, Savannah laboratory, mechanical department.

E. H. HOLLOWAY—title changed from superintendent diesel maintenance to diesel superintendent.

E. T. HARRISON, general diesel supervisor, appointed assistant diesel superintendent.

C. H. CARROLL, acting general diesel supervisor, appointed general diesel supervisor.

Chesapeake & Ohio

W. E. HUMPHREYS appointed shop scheduling engineer at Russell, Ky. Position of master mechanic at Ashland, Ky., formerly held by Mr. Humphreys, abolished.

M. L. MAHONE appointed assistant shop scheduling engineer at Clifton Forge, Va.

Chicago & North Western
Chicago

SAM FESUS, assistant superintendent car department, appointed superintendent car department.

C. P. NELSON, assistant superintendent car shops, appointed assistant superintendent car department.

E. W. GEBHARDT, superintendent car department, appointed assistant superintendent car shops.

M. H. CRANDALL, division general foreman at Winona, Minn., appointed master mechanic, Dakota division, at Huron, S. D.

H. P. COX, superintendent of shops at Clinton, Iowa, retired.

Chicago, Burlington & Quincy

H. H. URBACH, assistant vice-president (mechanical) at Chicago, retired.

RAYMOND E. KELLY, diesel material supervisor at West Burlington, Iowa, retired.

Missouri-Kansas-Texas

G. E. STEPHENSON appointed general master mechanic, with jurisdiction over locomotive and car departments north of Red River (Denison, Tex.), except Parsons diesel shop, Parsons shop order shop, and Sedalia car shop. Headquarters, Parsons, Kan.

Missouri Pacific

L. T. IMLER, road master mechanic, Eastern, Omaha and Northern Kansas Divisions, appointed terminal master mechanic, Kansas City Terminal Division. Headquarters, Kansas City, Kan.

L. W. MARTIN, road master mechanic, Wichita, Central Kansas and Colorado Divisions, appointed road master mechanic, Eastern, Omaha and Northern Kansas Divisions. Headquarters, Kansas City, Kan.

A. J. DANIEL appointed road master mechanic, Wichita, Central Kansas and Colorado Divisions. Headquarters, Wichita, Kan.

New York Central System
Eastern District

Title changes:

G. E. LAUTERBACH, industrial engineer to district engineering assistant.

H. J. GRAY, district supervisor management services, to district administrative assistant.

R. W. MUSTARD appointed assistant master mechanic, with jurisdiction over both locomotive and car departments. Headquarters, East Syracuse, N. Y.

E. S. MUSTAIN appointed assistant master mechanic, with jurisdiction over both locomotive and car departments. Headquarters, Superintendent's Office, Central Terminal, Buffalo.

KARL T. MILLER appointed superintendent of shop, Harmon diesel and electric shop, Harmon, N. Y.

L. C. LYTLE appointed district locomotive inspector. Headquarters, New York.

R. J. PARSONS appointed assistant master mechanic New York and Weehawken, Grand Central Terminal, Electric, Harlem and Putnam division, including North Bergen and south of that point, River division.

Pennsylvania

C. K. STEINS, mechanical engineer at Philadelphia, retired.

HARRY L. DECKER, assistant mechanical

engineer at Philadelphia, appointed mechanical engineer.

St. Louis-San Francisco

G. J. COSATT appointed assistant diesel superintendent, at Springfield, Mo. Formerly assistant diesel superintendent of the Missouri-Kansas-Texas at Waco, Tex.

J. H. HALL, JR., relief foreman at Springfield Mo., appointed general foreman at Tulsa, Okla.

H. G. THRELFALL, general foreman at Tulsa, Okla., appointed general foreman at Birmingham, Ala.

C. V. KNOX, general foreman at Kansas City, Mo., appointed general foreman at Amory, Miss.

A. C. THOMPSON, general foreman at Amory, Miss., appointed general foreman at Kansas City, Mo.

C. L. PEACHER, car foreman at Birmingham, Ala., appointed general foreman at Kansas City, Mo.

Seaboard Air Line

Transfer of headquarters: R. W. MURRAY, general diesel supervisor, to Hamlet, N. C.; J. C. WROTON, JR., diesel supervisor (system), to Norfolk, Va.; J. R. HAYES, diesel supervisor (system), to Jacksonville, Fla.; FRED WOODS, diesel supervisor (system), to Hamlet, N. C. Positions of diesel supervisor (system) at Tampa, Fla., and Howells, Ga., abolished.

E. A. THURMOND appointed general diesel supervisor. Headquarters, Jacksonville, Fla.

F. B. CLARK, master mechanic, Tampa, Fla., has had jurisdiction extended to include Wildwood, Fla. and that part of the North Florida division south of Wildwood.

W. J. SUBER, shop superintendent, at Jacksonville, Fla., has had jurisdiction extended to include North Florida division lines between Jacksonville and the North Yard limit of Wildwood, Fla., and west of Jacksonville.

Position of master mechanic, North Florida division, Jacksonville, Fla., abolished.

Southern

Hayne Shop, Spartanburg, S. C.

WALTER W. SIMPSON, JR., appointed general foreman car department.

WILLIAM C. WILLIAMS appointed production and material control engineer.

JESSE O. BROWN, JR. appointed general foreman car department.

RALPH H. BINGHAM appointed foreman enginehouse (night) at Danville, Va.

MILTON S. RUBLE appointed foreman (night) at Greensboro, N. C.

C. FRANK SHOAF appointed foreman machine shop at Spencer, N. C.

GEORGE M. WALTON appointed foreman erecting shop at Spencer, N. C.

HENRY E. GUYTON, JR. appointed foreman boilermakers at Atlanta, Ga.

DONNIS L. TALBERT appointed assistant foreman enginehouse at Columbia, S. C.

Obituary

S. B. HIGGINBOTTOM, 64, assistant chief engineer—signals and electric traction, Long Island, at Jamaica, N. Y., died February 6.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of December 1955	Month of December 1954	12 months ended with December 1955	12 months ended with December 1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,405	5,212	65,954	73,193
3-06	Total, Diesel-electric	37,305	34,315	428,750	391,435
3-07	Total, electric	700	655	8,966	7,792
3-04	Total, locomotive-miles	43,654	40,408	506,340	474,317
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,665	1,524	20,120	18,147
4-06	Empty, total	973	942	11,068	10,634
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	12,157	11,189	151,756	148,860
6-02	Total in oil-burning steam locomotive trains	1,822	1,368	26,254	26,180
6-03	Total in Diesel-electric locomotive trains	102,972	93,572	1,211,282	1,081,830
6-04	Total in electric locomotive trains	2,025	1,994	27,086	23,913
6-06	Total in all trains	119,784	108,859	1,425,162	1,287,179
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.02
10-02	Loaded freight car-miles	41.0	40.4	42.6	41.0
10-03	Empty freight car-miles	23.9	25.0	23.5	24.0
10-04	Total freight car-miles (excluding caboose)	64.9	65.4	66.1	65.0
10-05	Gross ton-miles (excluding locomotive and tender)	2,948	2,885	3,023	2,906
10-06	Net ton-miles	1,322	1,261	1,372	1,287
12	Net ton-miles per loaded car-mile (M-211)	32.3	31.2	32.2	31.4
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	63.1	61.8	64.5	63.1
14	Averages per train hour (M-211):				
14-01	Train miles	18.6	18.9	18.6	18.7
14-02	Gross ton-miles (excluding locomotive and tender)	54,205	54,000	55,662	53,897
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	42.6	43.6	46.9	42.8
14-02	All	44.4	40.9	44.5	40.3
15	Average net ton-miles per freight car-day (000) (M-240)	904	798	923	799
17	Per cent of home cars of total freight cars on the line (M-240)	41.7	53.6	44.8	53.1

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,390	2,050	16,627	26,594
3-06	Diesel-electric	21,472	21,830	243,642	250,918
3-07	Electric	1,399	1,477	15,672	16,660
3-04	Total	24,261	25,359	275,948	294,175
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	259,433	266,895	2,833,812	2,964,369
4-09	Total in coal-burning steam locomotive trains	8,852	10,946	96,158	131,220
4-10	Total in oil-burning steam locomotive trains	3,884	7,770	40,464	99,685
4-11	Total in Diesel-electric locomotive trains	230,222	231,337	2,508,161	2,548,482
12	Total car-miles per train-miles	10.32	10.18	9.86	9.71

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	293,447	262,551	3,480,279	3,626,790
1-02	Steam, oil-burning	40,931	51,903	877,141	649,059
1-03	Diesel-electric[1]	3,835,438	3,477,756	43,481,151	39,647,418
1-06	Total	4,173,626	3,799,305	47,610,641	44,025,181
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	8,047	12,089	100,527	141,295
2-02	Steam, oil-burning	4,600	5,266	62,822	62,581
2-03	Diesel-electric[1]	271,174	275,393	2,954,010	3,062,581
2-06	Total	311,920	320,200	3,429,427	3,576,337
3	Hours per yard locomotive-day:				
3-01	Steam	6.4	6.8	5.9	4.8
3-02	Diesel-electric	16.1	15.4	15.7	15.0
3-05	Serviceable	15.8	15.0	15.4	14.5
3-06	All locomotives (serviceable, unserviceable and stored)	14.4	13.0	13.7	12.4
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.73	1.73	1.64	1.69
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.74	.74	.75	.75

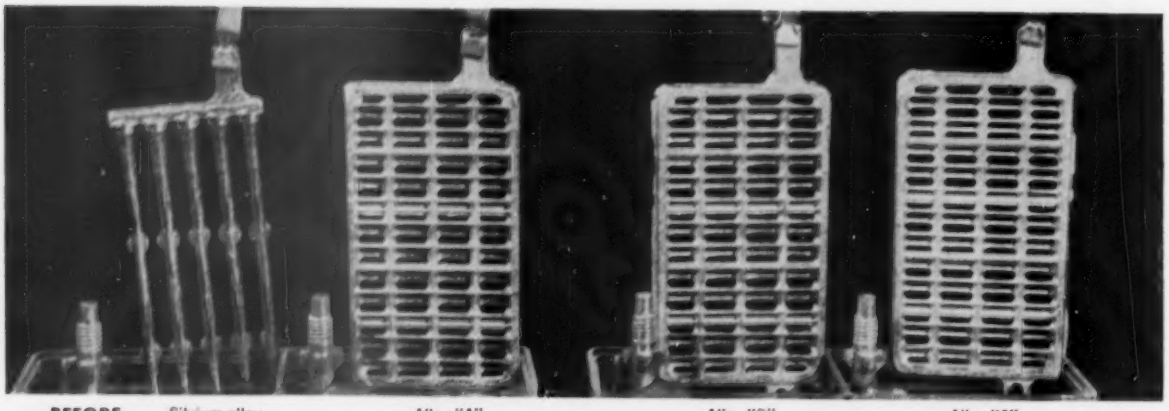
[1]Excludes B and trailing A units.

SUMMARY OF MONTHLY HOT BOX REPORTS

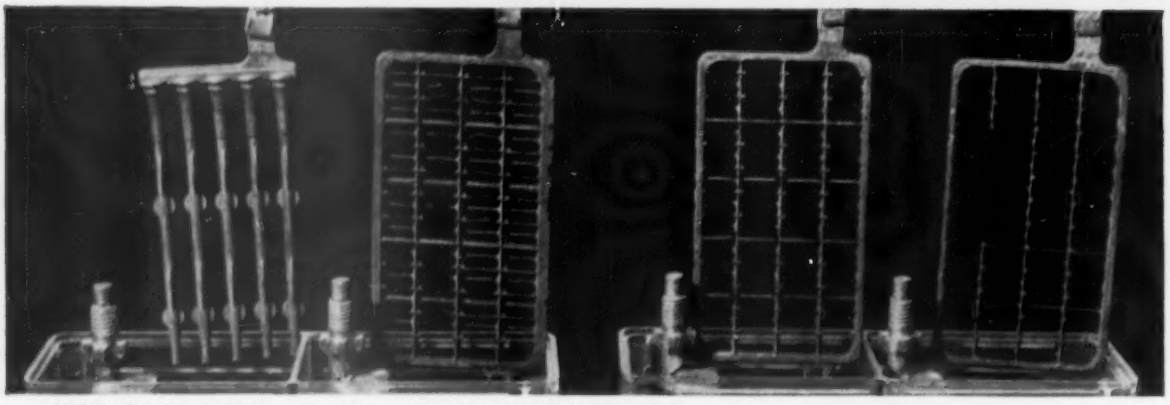
	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
December, 1951	2,752,316	2,130	5,398	7,528	365,611
December, 1952	2,869,929	1,742	3,632	5,374	534,040
1953					
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,853	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,961
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444

EXIDE-IRONCLAD BATTERIES

For railway diesel starting



BEFORE: Silvium alloy — Alloy "A" — Alloy "B" — Alloy "C"



AFTER: Note how the Silvium grid resisted corrosion. Compare it with the other alloys.

Corrosion resistant SILVIUM prolongs battery life

BATTERY FOR RAILWAY DIESEL STARTING. Model MV-D. Its tubular construction provides for extra reservoirs of electrolyte adjacent to positive plate. Battery better able to supply sudden heavy power drafts to turn over starting motors. Extra heavy connectors offer minimum resistance to heavy currents. Write for Bulletin 5348.

Reaching down deep into every Exide-Ironclad Battery are the fingers of Silvium alloy metal which form the grids of the famous Exide-Ironclad positive plates.

Silvium is a special alloy developed by Exide to resist corrosion and thus prolong battery life. For proof, Exide research engineers compared the performance of an Ironclad Silvium grid side by side with ordinary grids of other lead alloys. As the photographs above show, only Silvium came through the test without damaging corrosion—undiminished in size, unimpaired in strength. The other grids showed from moderate to severe corrosion.

Tests have proved that Silvium is not only more resistant to corrosion, but also a better conductor of electricity. Hence it both prolongs battery life and—because there's less internal battery resistance—more readily permits heavy drafts of power.

This special material is only one of the many exclusive features which have made Exide-Ironclad Batteries world famous for high capacity and long life. When you order batteries for heavy duty applications, or the equipment requiring such batteries, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

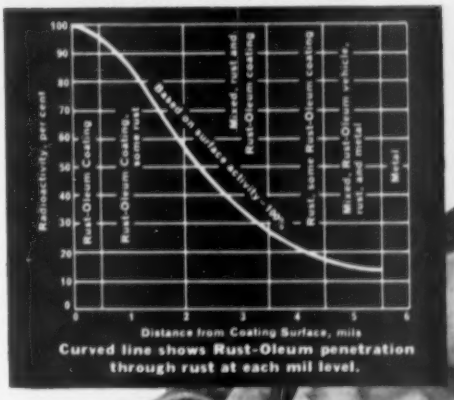
Exide®

There is only one Rust-Oleum . . . it is as distinctive as your own fingerprint.

RUST-OLEUM®
STOPS RUST!

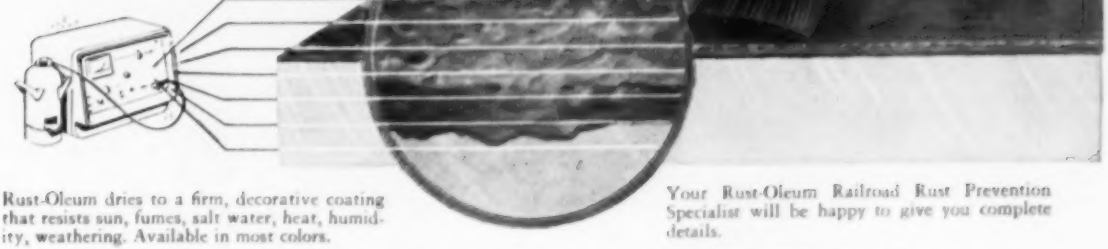
Penetration through rust to bare metal traced by Geiger Counter—Utilizing a modern tool of science, Rust-Oleum's *specially-processed* fish oil vehicle was radioactivated and formulated into Rust-Oleum 769 Damp-Proof Red Primer—then applied to rusted test panels. Geiger Counters then traced Rust-Oleum's *specially-processed* fish oil vehicle through rust down to bare metal. Because of this penetration, you can apply Rust-Oleum directly over sound rusted surfaces—usually eliminating costly surface preparations. Write for your copy of the thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," prepared by Battelle Memorial Institute technologists.

RUST-OLEUM CORPORATION
2591 Oakton Street, Evanston, Ill.



Curved line shows Rust-Oleum penetration through rust at each mil level.

Accept no substitutes. Buy—and specify only Rust-Oleum. You'll be happy that you did.



Rust-Oleum dries to a firm, decorative coating that resists sun, fumes, salt water, heat, humidity, weathering. Available in most colors.

Your Rust-Oleum Railroad Rust Prevention Specialist will be happy to give you complete details.

Rust-Oleum is available in practically all colors, including aluminum and white

SUPPLY TRADE NOTES . . . . . .

D. B. Bishop

L. E. Flinn

A. D. Nicolay

H. W. Keyser

DEARBORN CHEMICAL COMPANY.—*D. B. Bishop, L. E. Flinn,* and *A. D. Nicolay* have been elected assistant vice-presidents, Railroad Department, at Pittsburgh, Chicago, and Omaha, respectively. Mr. Bishop was formerly district manager, Pittsburgh; Mr. Flinn, manager, sales and service, Railroad Cleaner Department.

Elton R. Glover has been appointed director technical sales-service, Railroad Department.

■

GRIFFIN WHEEL COMPANY.—*Griffin* is proceeding with plans for constructing and equipping a plant in southern California. The new plant which will manufacture E Q S cast steel wheels for railroad cars, is expected to be ready for operation in about one year.

■

CONSOLIDATED RAILWAY EQUIPMENT COMPANY.—*Arthur J. Ryan,* who recently retired as fuel purchasing agent of the New York Central, has become associated with Consolidated as manager, domestic and international sales, at New York.

■

BLACK & DECKER MANUFACTURING CO.—The Pittsburgh factory sales and service branch of B&D has been relocated in a new building at 5437 Baum Boulevard, and a new branch has been opened at 488 East Main street, Columbus, Ohio.

■

FURANE PLASTICS INCORPORATED.—Arrangements have been completed with the *Permacel Tape Corporation* of New Brunswick, N. J., to engage in the sale and distribution of Epocast electrical insulating resins.

■

C & D BATTERIES.—*Robert M. Ash* has been appointed sales and service representative in the Kansas City area.

■

MACLEAN-FOGG LOCK NUT COMPANY.—*Harry Bishop* has been appointed general sales manager, industrial division.

■

ACF INDUSTRIES, INC., American Car & Foundry Division.—*David J. Belcher* has been appointed sales agent at Chicago. Mr. Belcher was formerly sales agent at Philadelphia.

■

BEAVER PIPE TOOL, INC.—*Gordon Burke* has been appointed district manager at Kansas City, Mo.

■

GENERAL STEEL CASTINGS CORPORATION.—*Robert M. Seely,* assistant mechanical engineer at Granite City, Ill., has been appointed mechanical engineer in charge of the engineering department there, to succeed *J. R. Vogel,* resigned.

■

ROCKWELL MANUFACTURING COMPANY.—*Rockwell* has acquired the assets of the *Locomotive Finished Materials Company,* which will continue under its present management as a major division of Rockwell.

■

OKONITE COMPANY.—*John D. Fess* has been appointed district manager of the Pittsburgh office. *James B. Caldwell,* previously at Los Angeles, has been appointed branch manager at Portland, and *Edwin R. Conklin* of the Portland staff has been appointed branch manager at Seattle.

SAFETY CAR HEATING & LIGHTING CO.—*Howard W. Keyser,* formerly manager at San Francisco, has been appointed manager of the New York office at 230 Park avenue. *John Van Nort* has been appointed an agent at 593 Market street, San Francisco.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*A. C. Meixner* has been appointed sales manager, transportation and generator division, at East Pittsburgh, Pa. Mr. Meixner succeeds *J. B. Walker* who has been transferred to Pittsburgh as sales manager of apparatus products.

Obituary

GEORGE F. HOLLY, SR., 73, retired manager of conduit sales, Youngstown Sheet & Tube Co., died January 31.

■

EDWIN P. COREY, 79, retired general manager of tubular sales, Youngstown Sheet & Tube Co., died January 29.

■

W. M. REED, 63, founder and chairman of the board of the American Air Filter Company, died on February 2.

EQUIPMENT *(Continued from page 14)*

Molybdenum-Base Lubricant

The last obstacle to the use of Liqui-Moly lubricants in many severe applications involving extremes of temperature, pressure, speed and exposure has been solved according to the manufacturer. Under certain conditions of exposure, the lubricant reacted with moisture in the air to form acids which were corrosive to some bearing materials.

To offset this possibility, a process of coating the dry powder with a chemical buffer before its becoming liquid was developed, preventing the formation of free acid. This buffer, Stabilex, not only also protects the oil in the lubricant from oxidation or acidity in use. The new stabilized molybdenum-base lubricant is offered in the established Liqui-Moly formulations of oils, greases and coatings, as well as in powder and wax-stick form. *Lockrey Company, Lubricants Division, Dept RLC, Southampton, N. Y.*

(Turn to page 88)

The MODERN Southern Pacific uses the MODERN Diesel lubricant

GULF DIESELMOTIVE OIL

104 YEARS AGO a small wood-burning locomotive forged the first link in what is now the gigantic Southern Pacific transportation system. Today powerful Diesels thunder over the maze of rails that make up this modern system which serves eight Western and Southwestern states.

Throughout the territory served by a subsidiary, the Texas and New Orleans Railroad, Southern Pacific Diesels are lubricated with Gulf Dieselmotive Oil. This modern Diesel lubricant contributes to better performance, greater availability, and lower maintenance costs on many of our nation's leading railroads.

here's why:

1. Chosen for their ability to prevent hard carbon deposits in hot spots, the selected base stocks of Dieselmotive Oil also provide an oxidation resistance safety factor.
2. 100% solvent refining of base stocks (which removes undesirable constituents) guarantees greater stability and more effective bearing protection.
3. Superior additive response is obtained by carefully matching the additives to the base stocks. This insures clean rings and grooves, a minimum of piston crown deposits.

CONSULT THE TELEPHONE DIRECTORY FOR THE NUMBER OF YOUR NEAREST GULF OFFICE.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

"You Get Extra Battery Performance –

America's Finest!
GOULD KATHANODE
BATTERIES
for Air Conditioning
and Car Lighting

The MATERIAL HANDLING INSTITUTE'S EXPOSITION
Cleveland, Ohio
PUBLIC AUDITORIUM
JUNE 5th THRU 8th
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EXHIBITOR
Booth 1425

THANKS TO GOULD FIELD ENGINEERING SERVICE!"

It's a proven fact that regular, systematic battery care can add months, perhaps years, to the life of a battery! Gould's nation-wide Field Engineering Service enables *you* to get the benefit of this added service . . . and lower your over-all battery power costs.

Your Gould Field Engineer's one job is to see that you get maximum service from your batteries. He is factory-trained to instruct your own men as to correct maintenance routines and to help set up a simple record system for anticipating battery needs.

There's a Gould Field Engineer in your area. He's as near to you as your telephone. Call him. And when you see him, ask him for the new Gould Plus-Performance Plan material for your battery maintenance staff.

Always Use Gould-National Automobile and Truck Batteries

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FOR CARS OF ALL CAPACITIES..

NEW

C-R®

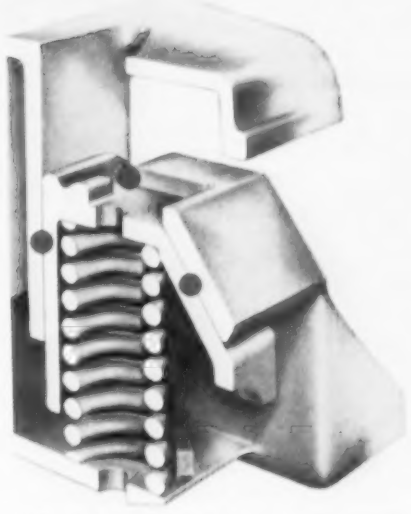
(Cushion-Ride)

PACKAGE UNIT

Applicable to *all* previously built, non-friction control trucks. Available with 2-1/2" or 3-1/16" spring travel.

ENGINEERED and BUILT BY

Buckeye



● CUTAWAY OF THE BUCKEYE C-R PACKAGE UNIT SHOWING THE FEATURED MAXIMUM FRICTION BEARING SURFACES.

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Refer Adv. 11882

Ask for Bulletin № 204

The Buckeye Steel Castings Co.
COLUMBUS, O.
NEW YORK, N.Y.
CHICAGO, ILL.
ST. PAUL, MINN.

45 G-E Super Gas Turbine-electrics Will Haul Union Pacific Freight Faster

In 1957 Union Pacific will receive the first of 45 new G-E gas turbine-electric locomotives. Delivery of the first unit will mark the culmination of 10 years of intensive research in the gas turbine-electric locomotive field.

Union Pacific President Arthur E. Stoddard has said of the new locomotives, "This power will aid our program for handling our expanding freight traffic load more efficiently. Union Pacific hauls freight faster than any other railroad in the world . . . this new equipment should enable us to do an even better job."

These new locomotives are designed to haul freight pay loads exceeding 5000 tons throughout the West. They will surpass any internally-powered units ever built in their ability to haul trains faster. Powered by 8500 hp they are geared for top freight speed of 65 mph. They are engineered to operate efficiently through a wide and rugged range of weather, temperature and terrain.

Cost of mechanical repairs on these locomotives is expected to be considerably less than on diesel-electric units of the same train handling capacity. Savings are also anticipated in electrical and power plant repairs.

Union Pacific has pioneered with G.E. in the field of gas turbine-electric locomotives. Since 1949 U.P. has installed 25 G-E 4500-hp units which each month see 10,000 miles of service.

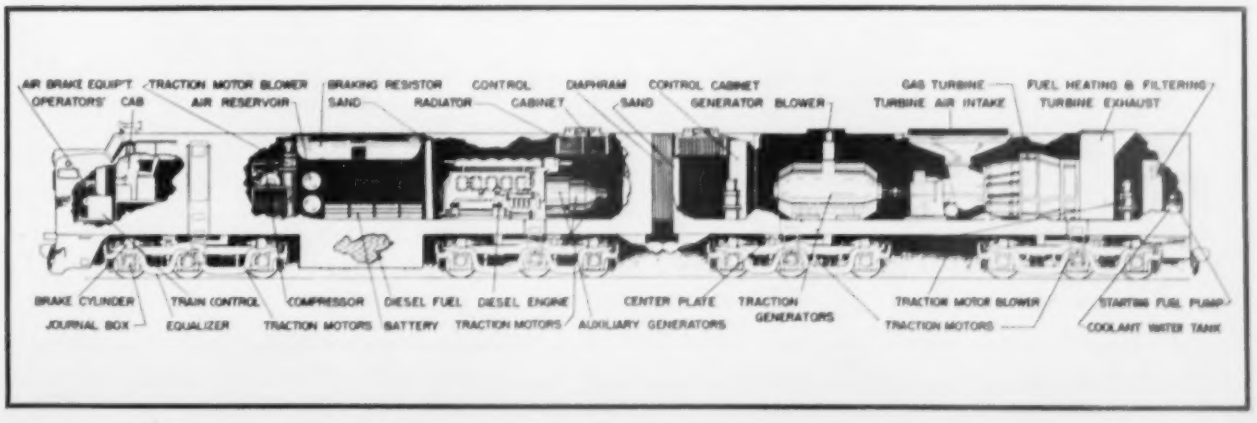
As the nation grows, and as railroads grow, G.E. research and engineering will constantly strive to further railroad progress. Ask your G-E Apparatus Sales representative for more information, or write Section 135-2, Locomotive & Car Equipment Dept., Erie, Pa.

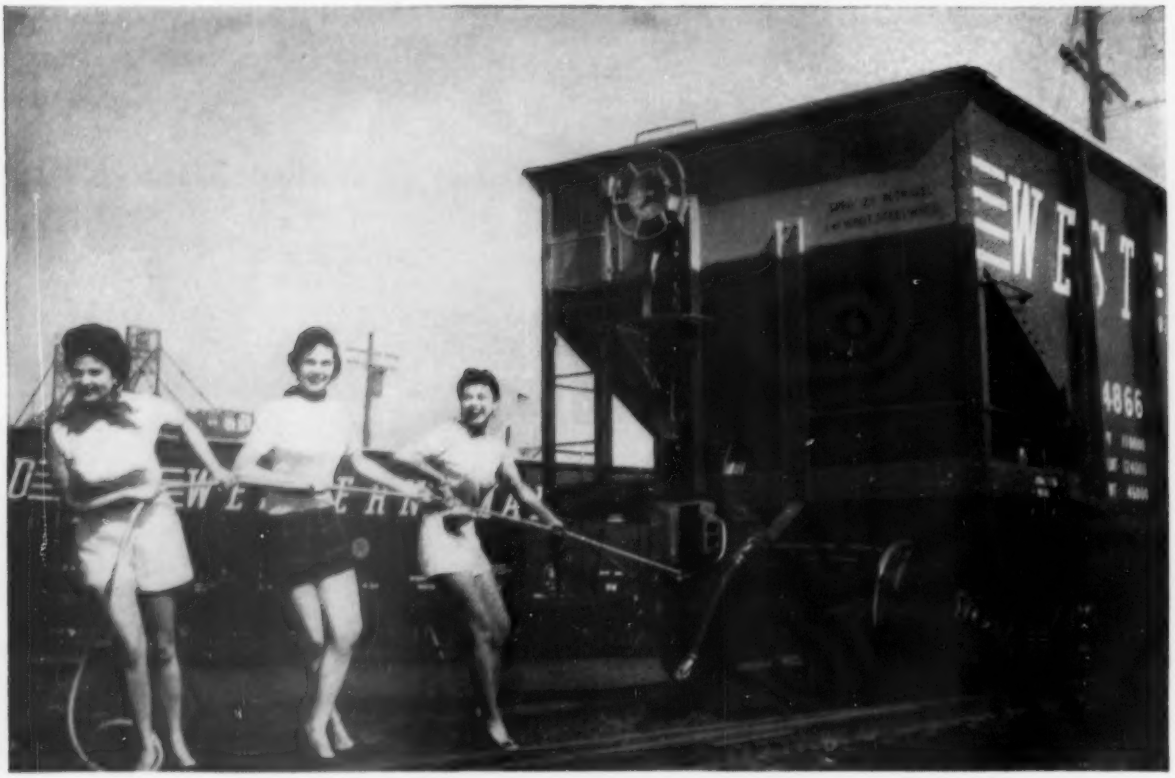
Progress Is Our Most Important Product

GENERAL ELECTRIC

LATEST OF 25 General Electric 4500-hp gas turbine-electric locomotives currently in service on Union Pacific Railroad. In the past 4 years these units have efficiently handled heavy freight service over more than 6 million miles of rugged western terrain.

UNION PACIFIC President Arthur E. Stoddard (left) and General Manager Guy W. Wilson, of General Electric's Locomotive and Car Equipment Dept., inspect a scale model of the new G-E gas turbine-electric locomotive. Operating units (see diagram below) will weigh 408 tons on 12 axles and will be 165 feet long (including the fuel tender) and 16 feet high.





Friction no problem when Timken tapered roller bearings carry the load. No freight cars set out between terminals . . . no car-days lost. And you cut terminal inspection man-hours 90%. Shippers gain delay-free, on-time deliveries. So provide more dependable service, make less demand on power, with bearings produced by The Timken Roller Bearing Company, Canton 6, Ohio.

The Timken Company uses steel containing nickel in bearings for "Roller Freight" cars

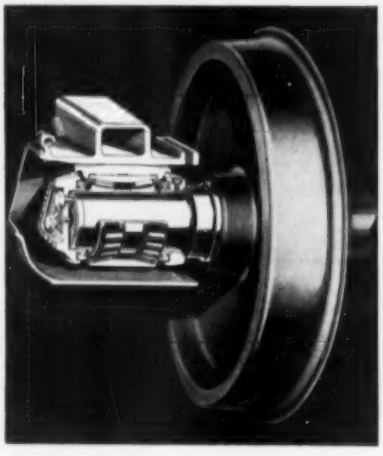
THESE GIRLS ARE ACTUALLY PULLING the car. In fact, frictional drag virtually disappears when a load rides on Timken tapered roller bearings.

They roll the load instead of sliding it.

No sliding, no hot box problem. There's just not enough friction. Axles turn on rollers and races of Timken's own special steel fortified with nickel. The addition of nickel makes possible high hardness plus extreme toughness. Accordingly, Timken tapered roller bearings with their positive roller alignment prove well able to carry lateral thrust. And, to save money hauling freight.

* * *

When you face questions about metal, let us give you the benefit of our wide practical experience. Write for List A of available publications. It includes a simple form that makes it easy for you to outline your problem.



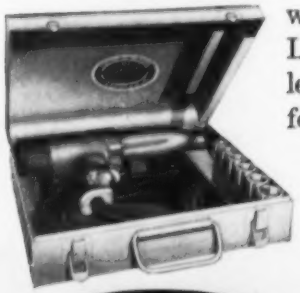
Cutaway view shows simplicity of Timken bearing design . . . a sealed roller bearing unit that requires no lubrication for years. Special nickel-rich steel makes races and rollers extra tough.

INCO **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N.Y.

"One of the best tool investments we ever made!"

The SIOUX Impact Wrench can easily cut nut running time to ⅓ of what it was by hand. When you think of the number of jobs requiring nut running, and the time involved, it's easy to see why men, who have been buying tools for a long time, say "It's one of the best tool investments we've ever made!"

Expect to cut your labor cost substantially with any impact wrench. Look to SIOUX for leadership in power, performance and endurance.



Model Number 325 **$ 99.75**
Model Number 330 **127.50**

The EXCLUSIVE

REVERSE CAP SWITCH LOCK

Prevents reversing with the switch on — eliminates burning commutator, brushes and switch contacts.

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for more information.....

USE SIOUX ALL THE WAY THROUGH

STANDARD THE WORLD OVER...

ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U.S.A.

ELECTRIC IMPACT WRENCHES • GRINDERS • FLEXIBLE SHAFTS • POLISHERS • DRILLS
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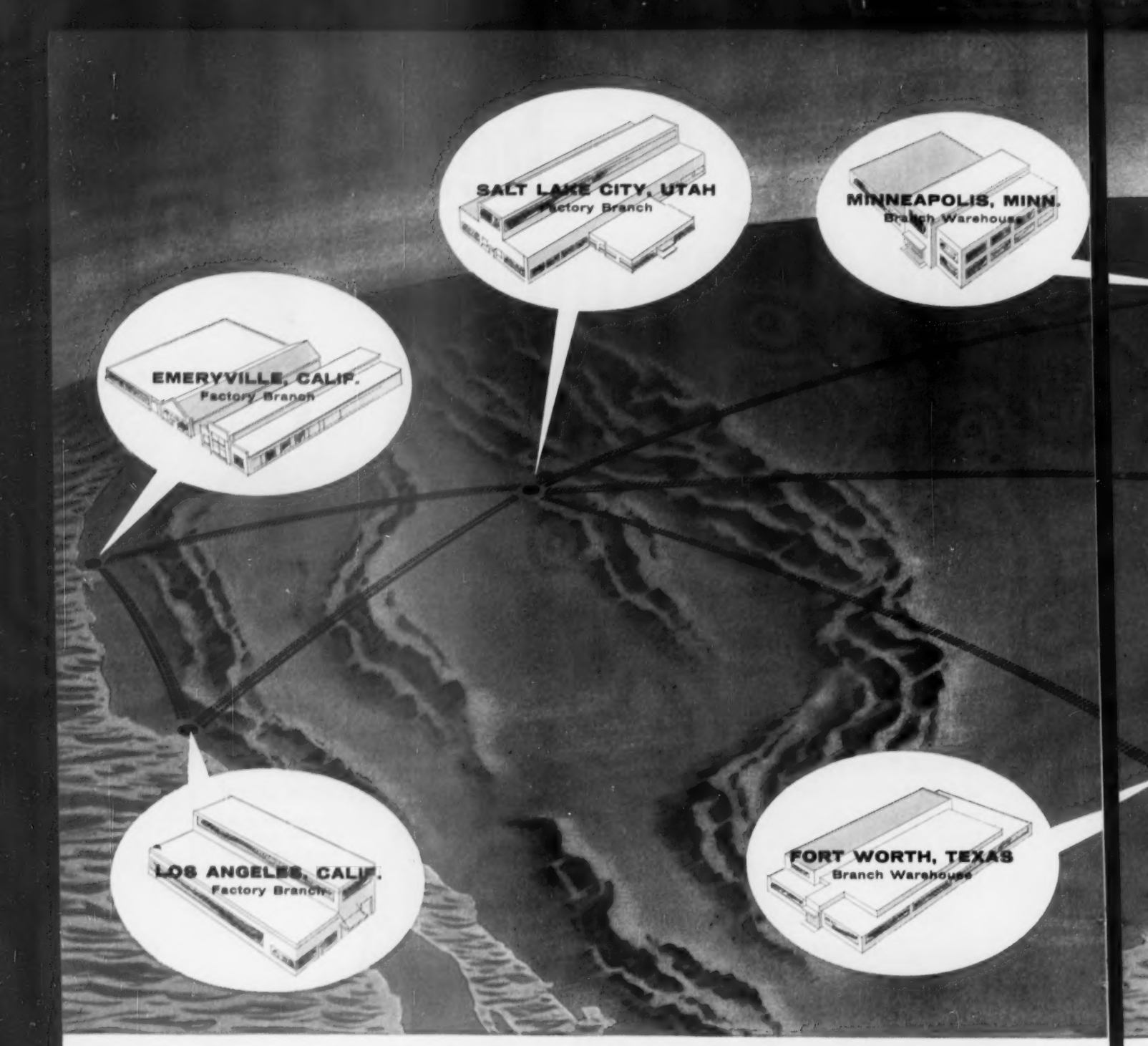


"ON-LINE" SERVICE FOR 96% of all General

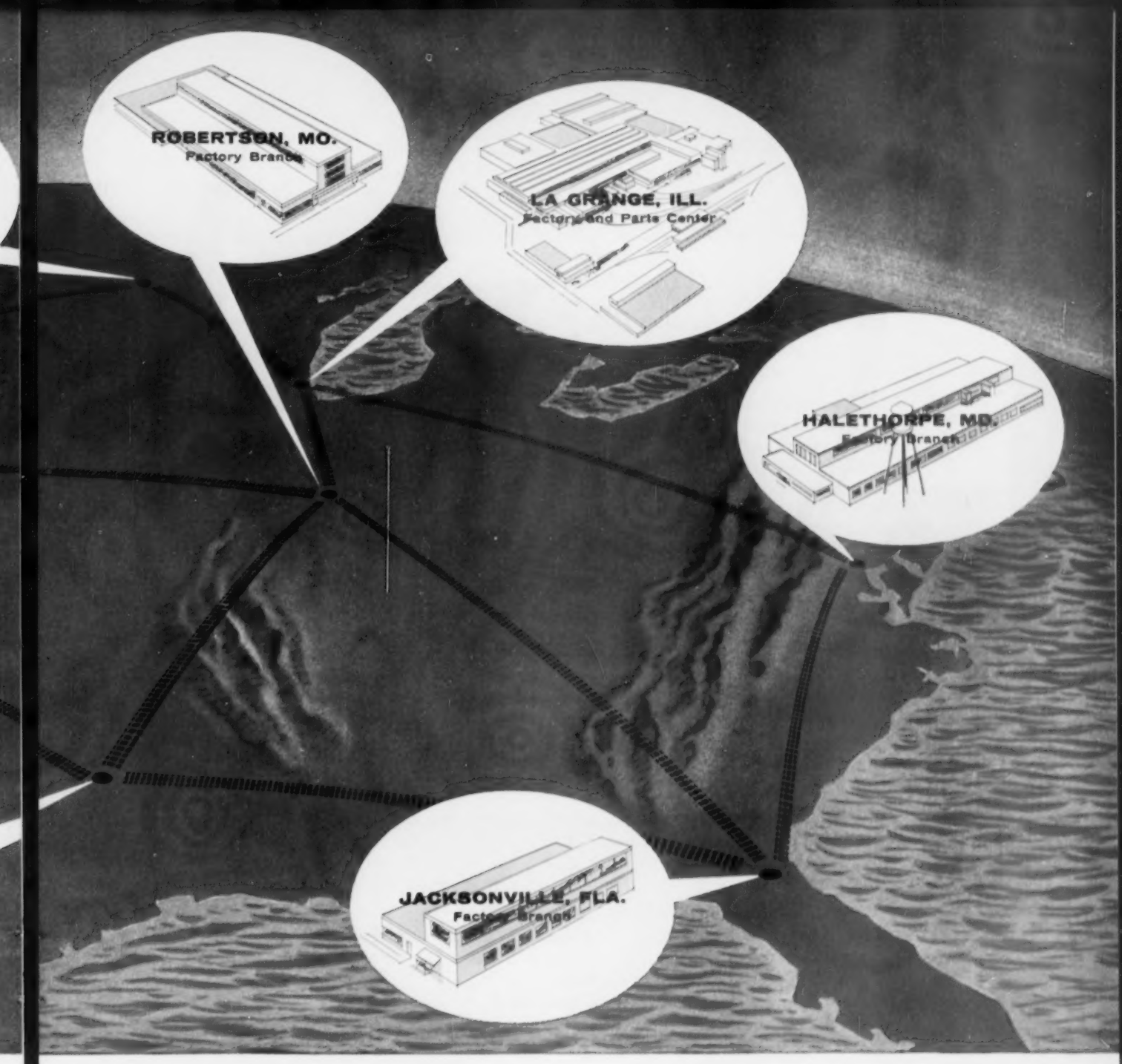
ELECTRO-MOTIVE'S strategic network of Factory Branches and Warehouses puts genuine General Motors locomotive parts within 24 hours of any point in the United States.

It provides "on-line" service for 96% of all General Motors locomotives in this country.

Six factory branches, plus our facilities at La Grange, handle *remanufacture* of major components with the same production-line efficiencies, the same laborsaving tools and equipment used in original manufacture.

Traction motors and other major components are available for immediate shipment on "Unit Exchange." You don't need to hold a locomotive out of service waiting for an assembly to be rebuilt. You can get factory-rebuilt motors overnight—and pay no premium for this service.

Latest improvements in design and manufacture are



Motors Locomotives in the United States

automatically incorporated—and you get the same warranty on "Unit Exchange" as on brand-new assembly.

In addition to saving investment in unneeded facilities, you can operate with smaller inventories—save transportation costs—and keep your locomotives at work more hours per year.

For further information on this moneysaving service, write us or consult your Electro-Motive Representative.

Electro-Motive Division

GENERAL MOTORS · LA GRANGE, ILLINOIS

Home of the Diesel Locomotive

GENERAL MOTORS LOCOMOTIVES

In Canada: GENERAL MOTORS DIESEL LIMITED
London, Ontario

THAT MEASLY LITTLE GRIT . . .

Can and Does Chew Up Diesel Engines

WIX makes a "big production" out of a little destruction . . . but that "little destruction" can add up to *millions* of *your* dollars!

Contamination in fuel and lubricating oil is a continuing problem. You can trace the service life and performance pattern of your diesel engines in direct relation to the cleanliness of lube and fuel oil and see exactly how important engineered filtration is to you!

WIX Oil Filter Cartridges are the product of objective research and engineering. They do a superlative job of keeping oil clean. They represent a solid form of insurance against excessive downtime, maintenance cost and engine wear.

Write for the WIX Railroad catalog. It has a definite answer for *you.*

WIX Lubricating Oil Replacement Cartridge with positive end seals—filtrant packed by volume-density method—reinforcing spring inside die slotted, machine formed center tube.

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ENGINEERED FILTRATION

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WIX ACCESSORIES CORP. LTD., TORONTO, ONT., CANADA

Warehouses:

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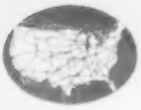


Norfolk and Western PS-1 Standardized Box Car journeys 33,000 miles over 45 roads in 19 months

The Norfolk and Western traced its PS-1 Box Car No. 44222 through 33,000 consecutive off-line miles which confirmed the value of its standardized design. Approximately 1⅓ times around the world, the miles No. 44222 rolled during this nineteen-month journey were divided among forty-five different railroads and terminal lines. Reaching all four United States borders and into Mexico, No. 44222 experienced all the hard general service demands of distance, weather, lading and diversified operating conditions that the Great American Railway System imposes on rolling stock.

Reports made to the Norfolk and Western indicated that No. 44222 gave satisfactory service during its trip and only minimum repairs were required when the car returned to the home line. Its performance is characteristic of the 69,433 PS-1s serving 72 different railroads.

An alert buyer of rolling stock, Norfolk and Western has ordered Standardized PS-1 Box Cars from Pullman-Standard six different times. These repeat orders confirm the value of standardization and contribute to the Norfolk and Western's continuing effort to provide shippers and consignees with superior levels of railroad performance.

the NORFOLK and WESTERN

Norfolk and Western PS-1 Standardized Box Car No. 44222 was built by Pullman-Standard in 1951. At the time of its 33,000 mile trip around the country, the car was a little less than two years old.

This simplified route map illustrates how N.&W. 44222 ranged the entire country, with a side trip into Mexico. It experienced all the conditions of the Great American Railway System.

MAINTENANCE

No. 44222's maintenance during its 33,000 mile trip proves PS-1 performance:

- One journal bearing application
- One new air hose
- Journal boxes repacked
- Air brakes cleaned
- Minor "B" end straightening
- Minor replacement of interior lining
- Light-weighed in accordance with A.A.R. Service Rules

relies on STANDARDIZATION

LOG OF N. & W. BOX CAR 44222, *From April 30, 1953 to December 3, 1954*

FROM	TO	DATE	MILEAGE
		1953	
Norfolk and Western	Western Maryland	May 1	310
Western Maryland	Reading	May 2	86
Reading	Central of New Jersey	May 2	130
Central of New Jersey	Wharton and Northern	May 11	115
Wharton and Northern	Central of New Jersey	May 14	Switch
Central of New Jersey	Reading	May 15	115
Reading	Western Maryland	May 17	132
Western Maryland	Baltimore and Ohio	May 17	55
Baltimore and Ohio	Terminal Railroad Association	May 20	795
Terminal Railroad Association	Missouri Pacific	May 20	Switch
Missouri Pacific	Union Pacific	June 4	279
Union Pacific	Missouri Pacific	June 9	Switch
Missouri Pacific	Gulf, Mobile & Ohio	June 19	270
Gulf, Mobile & Ohio	Southern	June 30	319
Southern	Baltimore and Ohio	July 6	558
Baltimore and Ohio	Erie	July 7	139
Erie	Baltimore and Ohio	July 18	196
Baltimore and Ohio	Southern	July 19	354
Southern	Central of Georgia	July 30	338
Central of Georgia	Georgia	July 29	134
Georgia	Seaboard Air Line	July 31	134
Seaboard Air Line	Richmond, Fredericksburg and Potomac	Aug. 2	500
Richmond, Fredericksburg and Potomac	Pennsylvania	Aug. 2	117
Pennsylvania	New York Central	Aug. 4	337
New York Central	Springfield Suburban	Sept. 4	860
Springfield Suburban	Detroit, Toledo and Ironton	Sept. 4	Switch
Detroit, Toledo and Ironton	Nickel Plate	Sept. 5	70
Nickel Plate	Missouri Pacific	Sept. 6	284
Missouri Pacific	Texas and Pacific	Sept. 7	493
Texas and Pacific	Gulf, Colorado and Santa Fe	Sept. 14	349
Gulf, Colorado and Santa Fe	Texas & New Orleans	Sept. 21	317
Texas & New Orleans	Frisco Lines	Oct. 9	994
Frisco Lines	International-Great Northern	Oct. 31	31
International-Great Northern	National Railways of Mexico	Oct. 28	338
National Railways of Mexico	Gulf Coast Lines	Nov. 14	380
Gulf Coast Lines	International-Great Northern	Nov. 19	372
International-Great Northern	Texas and Pacific	Nov. 20	592
Texas and Pacific	Missouri Pacific	Nov. 20	90
Missouri Pacific	Terminal Railroad Association	Nov. 26	493
Terminal Railroad Association	Pennsylvania	Nov. 27	Switch
Pennsylvania	Reading	Dec. 15	959
		1954	
Reading	Pennsylvania	Jan. 8	112
Pennsylvania	Illinois Central	Jan. 19	886
Illinois Central	Gulf, Mobile & Ohio	Jan. 26	108
Gulf, Mobile & Ohio	Elgin, Joliet and Eastern	Feb. 3	149
Elgin, Joliet and Eastern	Milwaukee Road	Feb. 4	58
Milwaukee Road	Duluth & Northeastern	Feb. 8	548
Duluth & Northeastern	Milwaukee Road	Feb. 9	Switch
Milwaukee Road	Northern Pacific	Feb. 11	Switch
Northern Pacific	Milwaukee Road	Feb. 14	236
Milwaukee Road	Kewaunee, Green Bay and Western	Feb. 22	663
Kewaunee, Green Bay and Western	Ann Arbor	Mar. 10	37
Ann Arbor	Baltimore and Ohio	Mar. 12	382
Baltimore and Ohio	Pennsylvania	Mar. 17	79
Pennsylvania	Illinois Central	April 2	848
Illinois Central	Texas & New Orleans	April 6	744
Texas & New Orleans	Missouri-Kansas-Texas	April 11	232
Missouri-Kansas-Texas	Texas & New Orleans	April 17	327
Texas & New Orleans	Southern Pacific	April 19	614
Southern Pacific	Union Pacific	May 13	2,058
Union Pacific	Chicago and North Western	May 16	980
Chicago and North Western	Soo Line	May 28	360
Soo Line	Baltimore and Ohio Chicago Terminal	June 2	449
Baltimore and Ohio Chicago Terminal	Baltimore and Ohio	June 8	Switch
Baltimore and Ohio	Pennsylvania	June 8	471
Pennsylvania	Alton and Southern	June 12	611
Alton and Southern	Litchfield and Madison	June 12	10
Litchfield and Madison	Chicago and North Western	June 13	59
Chicago and North Western	Union Pacific	June 15	567
Union Pacific	Illinois Central	July 16	3,934
Illinois Central	Central of Georgia	July 18	1,811
Central of Georgia	Southern	July 31	252
Southern	Atlanta and West Point	Aug. 9	88
Atlanta and West Point	Georgia	Aug. 16	174
Georgia	Southern	Aug. 19	302
Southern	Missouri Pacific	Sept. 4	551
Missouri Pacific	Southern	Oct. 7	300
Southern	Pennsylvania	Oct. 24	448
Pennsylvania	New Haven	Oct. 28	777
New Haven	Lehigh and Hudson River	Nov. 6	466
Lehigh and Hudson River	Central of New Jersey	Nov. 6	66
Central of New Jersey	Reading	Nov. 6	17
Reading	Western Maryland	Nov. 7	130
Western Maryland	Baltimore and Ohio	Nov. 7	501
Baltimore and Ohio	Southern	Nov. 9	230
Southern	Florida East Coast	Nov. 24	783
Florida East Coast	Atlantic Coast Line	Nov. 30	732
Atlantic Coast Line	Norfolk and Western	Dec. 3	653
Total Mileage Between Interchange Points			**33,154**

NORFOLK AND WESTERN 44222, a PS-1 Standardized Box Car, was built by Pullman-Standard in 1951 and began its nineteen month, 582 day trip in 1953. It is still in active N.&W. service and reported to be in excellent condition.

The range of its recorded journey was typical, as were its remarkably low maintenance requirements. PS-1 dependability, under all the hard-service conditions of the Great American Railway System, is a major reason for its acceptance.

Norfolk and Western 44222 is representative of the 3000 PS-1s this progressive railroad has ordered from Pullman-Standard on six separate occasions. And it is typical of the 69,433 PS-1s put in service by 72 standardization-conscious roads.

Pullman-Standard first introduced the concept of freight car standardization to the railroad industry in 1946. With 1956 marking the tenth anniversary of this event, the roads of the Great American Railway System have demonstrated their acceptance by ordering more than 100,000 P-S standardized cars of all types. In addition to the PS-1 Box Car, Pullman-Standard's line of standardized freight cars now includes the PS-2 Covered Hopper, PS-3 Open Top Hopper and PS-4 Flat Car. Each of these four cars is engineered, tested, crafted and mass produced for maximum service, with minimum first cost and maintenance. And each is sufficiently flexible in design to permit adaptation to individual railroad requirements.

Whatever your freight car needs may be, equipment built by the nation's leading car-builder will provide the superior performance users expect, and get, from Pullman-Standard products.

BUILT TO SERVE BEST ON THE

GREAT AMERICAN RAILWAY System

BY PULLMAN-STANDARD

WORLD'S LARGEST MANUFACTURER OF PASSENGER AND FREIGHT CARS

PULLMAN-STANDARD

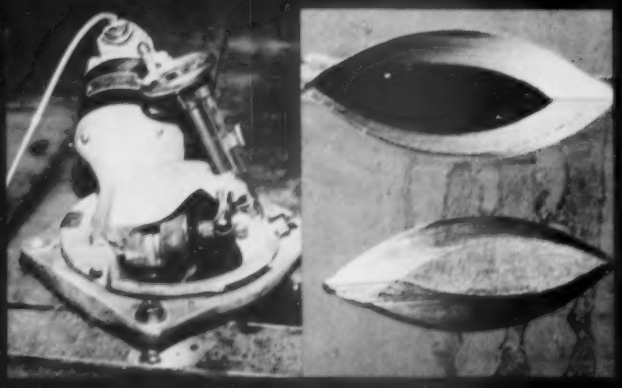
CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

79 EAST ADAMS STREET, CHICAGO 3, ILLINOIS

BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

standardization allows full use of modern production facilities



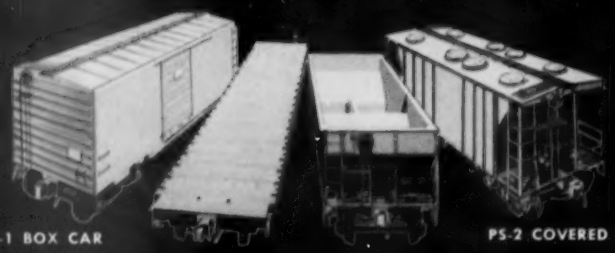
Pace setter in welding, Pullman-Standard uses special probers to sample welds and prove penetration. Exclusively P-S automatic welding machines supplement precision down-hand welding and insure structural durability.

Pullman-Standard's huge R&D Laboratory puts cars, materials and procedures through continuous and intensive testing. R&D findings are carefully evaluated for every possible means of making already superior cars even better.

P-S has a tremendous investment in dies, jigs and fixtures which enhance precision craftsmanship, full use of mass production techniques and the principles of automation. This means cars that serve better, last longer.

Standardized P-S Freight cars are followed into the field by trained and highly critical Field Service Engineers. P-S cars and others are carefully inspected and factually reported on. Findings are analyzed for clues to improvements.

Built to serve best on the
GREAT AMERICAN RAILWAY SYSTEM



PS-1 BOX CAR
PS-4 FLAT CAR
PS-3 HOPPER CAR
PS-2 COVERED HOPPER

WORLD'S LARGEST MANUFACTURER OF PASSENGER AND FREIGHT CARS

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY
SUBSIDIARY OF PULLMAN INCORPORATED
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BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

The Engineer's Field Report

CASE HISTORY

LUBRICANT RPM Delo Oil RR Special

FIRM Northern Pacific Railway, Missoula, Montana

Diesel still using original rings, bearings after 140,000 miles on mountain freight run

FOUR PERCENT GRADES and 16-degree curves make Northern Pacific's run through Lookout Pass a severe test for diesels. Locomotives haul ore and heavy equipment between Wallace, Idaho, and St. Regis, Montana, on a daily round-trip schedule of 114 miles. Using RPM DELO Oil RR Special, a GP-7 on this run has gone 140,000 miles with original rings and bearings—and is still in service. Northern Pacific says, "We have never had any trouble with this locomotive. It is still very clean, still performing well." Three other GL-7's and a GP-9 (above) have been used on the run during a 2½-year period. Northern Pacific Railway uses RPM DELO Oil RR Special in all road diesels on this run.

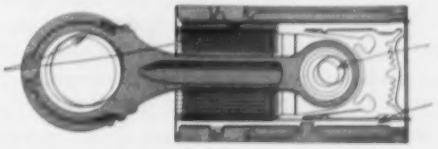
FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

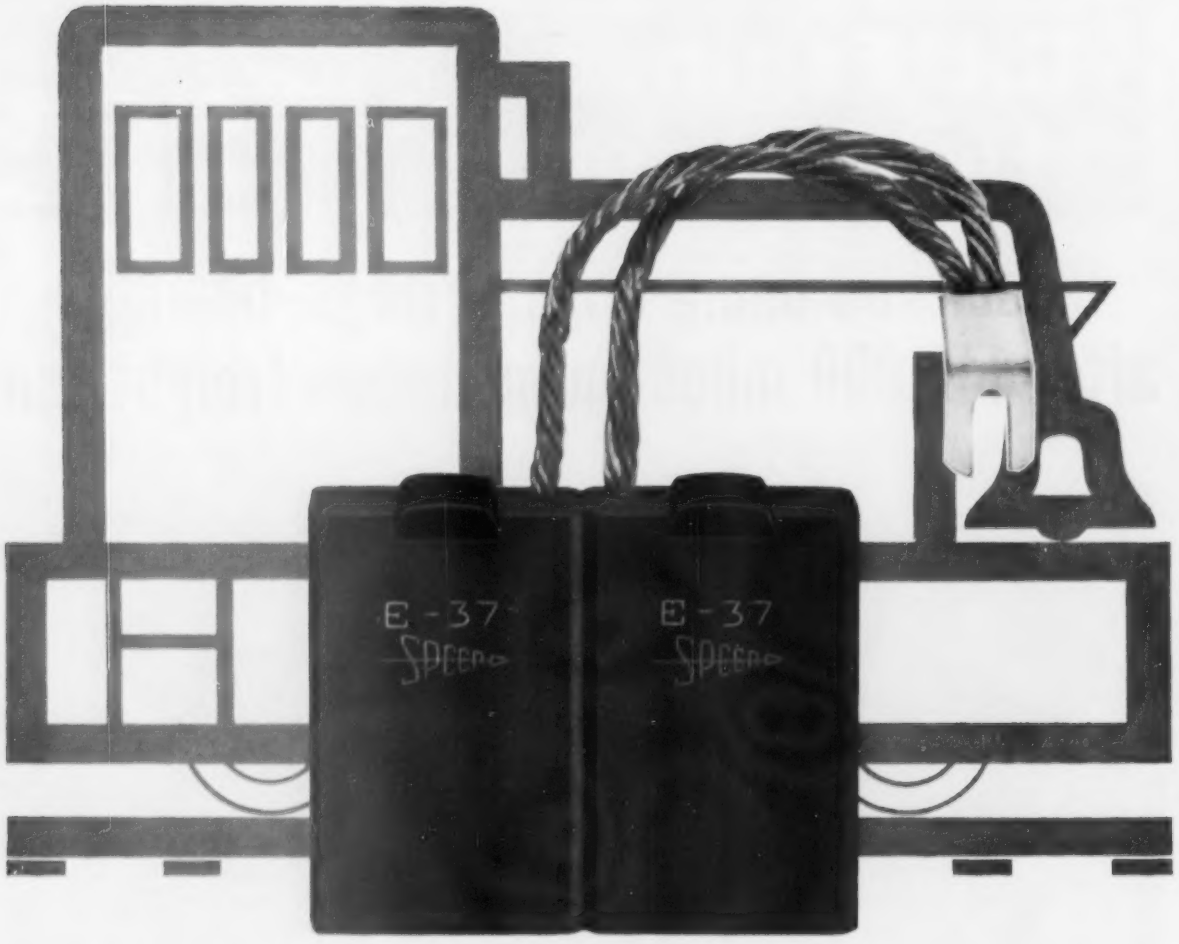
Why RPM DELO Oil RR Special prevents wear, corrosion, oxidation

Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.



Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean... helps prevent scuffing of cylinder walls. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



Here's a brush that's built to take it!

It's the Speer E-37 paired brush, specifically manufactured for use in the traction motors of industrial-type diesel-electric locomotives.

These rugged engines put in a lifetime of grueling service; every day their brushes take a beating from shock and vibration. But the E-37 paired brush assures effective commutation and long, maintenance-free service under stress because its design includes such exclusive features as:

a neoprene pad inserted in the top of the brush to absorb shock and reduce vibration

a strong, vibration-proof shunt connection—made solid with Speer's own patented tamping compound

Whether you are maintaining an industrial motive unit or higher horsepower diesel-electric locomotives, there's a Speer brush made specifically for your equipment. And you'll find that Speer brushes consistently have a competitive edge because of their expert design and careful manufacture.

Speer brushes are designed for even wear, reduced vibration. That's why they give you improved commutation, longer service life . . . than ordinary brushes.

Write now for the new Speer Brush Catalog

SPEER Carbon Co.
St. Marys, Pa.

Why NATIONAL TRADE-MARK *brushes are best for*

Passenger Service

Here are some of the requirements brushes must satisfy in traction motors, generators and auxiliary equipment on passenger-service locomotives . . . and why "National" brushes perform better and cost less than any other brand:

1. **Long Life for Long Runs**—"National" brushes have an outstanding record for continued improvement of service-life characteristics.
2. **Better commutation for smooth, fast starts** — "National" brushes give smooth power-transition with minimum equipment-maintenance for either short runs or long hauls.
3. **High strength for high impact** — "National" brushes, shunt connections and cables are carefully engineered to provide maximum assurance against mechanical failure.
4. **Improved commutator condition for minimum maintenance** — the superior film-forming properties of "National" brushes are the result of the most extensive brush-development program in the Railroad Industry.

Not only in passenger service but in *all* types of diesel-electric locomotive operation, "National" brushes deliver more for your brush dollar. Specify "National" — the brand proved by performance and used more than all other brands combined!

NATIONAL TRADE-MARK **BRUSHES**

Best For All Types Of Equipment . . .
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The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation
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For maintenance-of-way equipment...

For Diesel switching engines...

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Whatever size Diesel engine...

ALWAYS SPECIFY ESSO DIESEL FUEL

You'll get the *right* fuel for your diesel equipment when you call on the expert technical advice of Esso sales engineers. Many years of experience analysing railroad needs, combined with scientific skill in the exact application of high-quality Esso Diesel Fuels, assures top performance for your diesels.

Every Esso Diesel Fuel is developed by constant research on the road and in the lab to meet a specific requirement. With outstanding coverage of bulk storage points in our area, the right grade is always available. You can rely on *all* Esso Railroad Products for the same high quality and dependable performance as famous Esso Diesel Fuels. For any fuel or lubricating problems, be sure to call on Esso.

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RAILROAD PRODUCTS

Esso Standard Oil Company,
Railroad Sales Division,
15 West 51st St., New York 19, N.Y.

EDITORIALS . . . . . .

Chemically-Powered Locomotives

It has been suggested by A. M. Adams, Central Electricity Research Laboratories, Leatherhead, Surrey, England, that electrochemical batteries might be used to power railroad locomotives. This would dispense with engines and generators and require only traction motors and control equipment.

The electrochemical cell is not a new conception and it would appear that it is still in an early state of development. Basically, the batteries consist of cells having porous plates. Electrolyte is circulated between the plates to reduce concentration polarization and chemically different gases are fed to the backs of positive and negative plates respectively to replace active material on the plate which is used up in the process of generating electric power.

The gases might be carried in pressurized tanks or they might be produced on the locomotive by means of a coal-fired gas producer. Thermal efficiencies of about 20 per cent are indicated.

In their present state of development, the different types of cells under consideration either require gases of prohibitive cost or are of such a size as to limit their use to relatively low-powered locomotives. It would appear from the way the work is progressing now that those working on this subject may have something to offer within the next ten year period.

The production of electric power from atomic energy or directly from fossil fuel will almost certainly one day become an economically practical reality. But the potentials of these power sources and of electrochemical batteries for locomotives are still too uncertain to exert any influence on our present selection and use of railway motive power. Apparently, such a radical departure in motive power is well in the future.

Electrification at 50 Cycles

A decision by the British Transport Commission to change its mind and decide to use a 25,000-volt, 50-cycle contact system on 1,210 of the 1,460 route miles of its electrification program has considerable significance. In 1951 the Commission's technical committee had decided on 1,500 volts d-c. For guidance in reaching this conclusion the committee had knowledge gained in France and in Africa on the use of commercial frequencies and a British experimental installation introduced in 1952.

Use of a 50- or a 60-cycle system has been made practicable by the development of rectifiers which can be used on the locomotive without causing undue communication line disturbances. The rectifier works equally well on 60 or 25 cycles and the locomotives may employ d-c traction motors which have ideal traction characteristics and which are, because of the diesel, now in quantity production.

A prime advantage of the use of commercial frequencies is that power developed by the utility companies may be used direct without need for conversion. The question as to what this will do to phase balance on the utility power system has often been raised, but the utility systems are now so large with relation to the railroad load that this apparently no longer presents a very serious problem.

Comparing the 1,500-volt d-c systems with the 25,000-volt a-c system as applied to the British program, it is calculated that the a-c system will save 63 per cent in the cost of copper conductors, 17 per cent in steel for supporting structures and will require 12 substations instead of 70. Instead of 250 miles of 33-kv feeder cable to take current from the utility lines, less than 17 miles will be necessary and the aggregate capacity of transformers can be reduced by one-third.

Because of the relatively high prices of coal and oil in England, her railroads have a much better reason for using electric traction than do our railroads in the United States. It would appear, however, that we may learn much from her example. As our fuel prices rise with relation to those of electric power, electrification will appear more desirable, and England's experience with the use of commercial frequencies may reduce our investment costs and perhaps also eliminate the question of what system to use.

Where Are We Heading with Fuel?

The Southern Pacific's decision to test its dual fuel operation on a fleet basis is important news for two reasons. It first of all indicates that results of a two-year test with this system, now on over 15 locomotives, must have been pretty conclusive.

Of equal or perhaps greater implication is the line's reasoning in going to heavy fuel for running and using the expensive high-grade light oil for idling and warm-up only—that, in previous years, "diesels burned fuel which would keep the engines idling efficiently, rather than that which was most efficient under working conditions."

Economy fuels generally have been successful in that they saved more in the fuel bill than they increased the

PUT YOURSELF IN THIS PICTURE AND ASK—

"... just what can we do to prevent damage here?"

"That's easy—switch to the National MF-400 Rubber-Cushioned Draft Gear. It fits both standard pocket and yoke."

"Yes, I know that. But what does it have to offer over friction gears?"

"Well, first of all, tests prove that most coupling is performed at 7 to 8 mph—not at 4 to 5 mph. And at today's higher speeds, friction gears simply don't have it . . ."

"In what respects?"

"I don't want to sound too technical but here's why. The impact quantum is the amount of work that must be done in any impact. Purpose of the rubber cushioning is to permit this work to be done with a minimum of force transmitted to the car. This reduction in force is performed by the *extra-long travel* and *high cushioning capacity* of National Rubber Draft Gears."

"Longer travel makes lots of sense to me. Do you have any test figures on capacity of your National Rubber Draft Gear?"

"We certainly do. We measure and record forces on modern *electronic* instrumentation installed in cars on test tracks at our new Technical Center. That gives National *duplicated*—not laboratory simulated—operating conditions . . ."

"Now you're talking. Let's go into my office and go over actual figures . . ."

AA-2612

National Rubber-Cushioned Draft Gears give you protection when you need it—at high impact speeds!

NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

Cleveland 6, Ohio

COUPLERS • YOKES • DRAFT GEARS • FREIGHT TRUCKS • SNUBBER PACKAGES • JOURNAL BOXES and LIDS

maintenance bill and did this without introducing serious operating problems. But there is another side to the picture. Economy fuels have not been universally successful—especially those way down the line like those used by the SP. One road found that the increase in engine repairs amounted to over 13 times the saving in fuel cost. Ring wear, for example, was three times as great at the end of the test period as would normally be expected after ten times the test mileage. Other roads have had difficulties approaching if not equalling these. There have been more troubles with it than might at first seem apparent because not much is heard about tests that flop.

This is not to condemn the basic idea of economy fuel. Success has usually resulted *when* roads have proceeded cautiously and scientifically in their use. The "when" qualification is important. Plunging headlong into lower grade fuel can be pretty risky.

Thus right now might be a pretty good time to weigh the consequences of lowered fuel specifications. There will, no doubt, be increased pressure from management to use more and cheaper economy fuel partially as a result of the SP and other successful tests with it, and partially because of the general tightening trend in the availability of high-grade diesel fuel. Just how far should each road go to meet this situation? What kind of experimentation program will be needed to keep the risk within tolerable bounds?

A conservative program necessary to avoid undue maintenance risks will not be easy to sell to management. Rightly or wrongly, most managements seem to feel that the mechanical man's thoughts are biased. He naturally has everything to lose in the way of increased maintenance and operating trouble, but little to gain directly as fuel savings are not reflected in his budget. His case for a program applicable to his road as to what fuel may safely be experimented with under what conditions must therefore be all the stronger.

Letters to the Editor

Reduce Hot Boxes

To the Editor:

The many deficient practices, uncovered by AAR mechanical inspectors in the course of their work, point to the desirability of railroad personnel at originating and classification terminals making frequent on-the-ground checks *behind* car oilers in order to know beyond a doubt that all journal boxes are being conditioned as recommended in Sec. 1X of the AAR Lubrication Manual. It is advisable also to examine the oiler's equipment occasionally, which may disclose the use of packing irons having blades entirely too short for the purpose intended, or the carrying of *empty* oil cans.

When cars are on repair tracks, it is suggested that they be given an all-around minute inspection, not only as relates to defects for which the cars were shopped, but having in mind the condition of the wheels, truck sides, bolsters, side bearings, springs, snubbers, center plates, brake beams, foundation brake attachments, etc. Center plates must be properly lubricated, not broken or otherwise defective, and have adequate clearance. It is also suggested that missing or defective dust guard seals be replaced in all "in date" journal boxes.

The journals, journal bearings and wedges of *all* cars passing over the repair tracks should be carefully examined with the aid of a feeler hook and a flashlight, without which no inspection of such car parts can be properly completed. After all defective parts are renewed, the packing should be adjusted and oil added to each box as prescribed.

Candidly speaking, there is a tendency on repair tracks to permit "in date" journal boxes to go unattended on the theory that the necessary attention will be provided in the classification yards. It follows, of course, that this results in the boxes going without any attention at all. Obviously, the ideal place for car inspection and necessary repairs is at the *repair track*.

If a car is in the shop because of a hot box, all eight journal bearings should be lifted to inspect the bearings, wedges and particularly the journals properly. This is also advisable when a broken lug is discovered, as others will often be found in the same defective condition, though not possible to detect with the use of a hook or in any other way than by lifting.

Hot boxes occur approximately three times oftener under tank cars than under other conventional types of interchange freight car equipment. While there has been no immediate explanation of the cause, it may be partly due to the comparatively large number of trucks now under tank cars which are anything but modern. By that it is meant that only 8 per cent of the tank cars in service are equipped with long-travel truck springs together with snubbing devices of one type or another. The balance, or 92 per cent, have old-style trucks with short (1⅝ in.) travel truck springs, and generally no snubber. Further, several car owners now replace defective snubbers in old-style trucks with ordinary helical-type springs.

Railroad investments in modern shop equipment, materials and methods are often largely nullified by the lack of adequately-trained and supervised car repair forces, cooperating fully in efficient car maintenance and use. Satisfactory improvements can be made, especially when railroads and private car owners work together as they are now doing in some districts in solving their mutual problems.

A Chief Inspector

New Books

APPRENTICESHIP—PAST AND PRESENT, prepared by Reginald Perry, Bureau of Apprenticeship, United States Department of Labor. The booklet compares the inadequate, antiquated training methods of the past with the thorough, carefully planned, well-organized apprentice training procedures of today. It traces the development of apprenticeship in this country since the earliest days, explaining step-by-step improvements from the apprentice-master stage—or "domestic apprenticeship," as it has been appropriately labeled—to today's comprehensive apprenticeship systems, as conducted by training directors, apprentice supervisors and coordinators, in cooperation with joint management-labor apprenticeship committees. Examples of apprentice indentures dated 1640, 1676, 1715 and subsequent years are contrasted with present-day apprenticeship agreements.

Government Printing Office, Washington 25, D.C. Price, 20 cents.

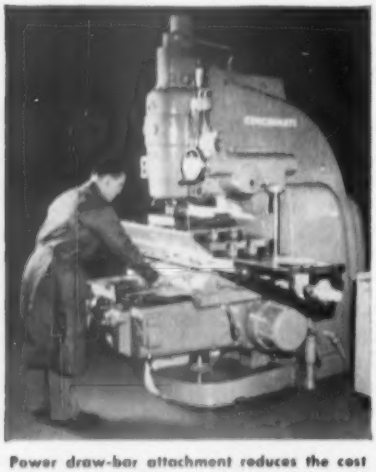
For Quickest Action in Cutting Metal and Costs

NEW CINCINNATI HIGH POWER and DUAL POWER DIAL TYPE MILLING MACHINES

Primarily, you're cutting costs when you step up cubic removal of metal. And you have plenty of opportunity to remove metal as rapidly as the work and fixture will permit when you assign the job to a new CINCINNATI® High Power or Dual Power Dial Type Milling Machine. These new knee types are tops in cutting capacity; tops in easy, convenient operator control; tops in low maintenance expenses. You'll be interested in the "vital statistics" shown in the table below. ¶Cost-reducing possibilities of the High Power and Dual Power Dial Types include 24 spindle speeds . . . 32 feeds (⅜ to 90 ipm) . . . full power to the spindle with independent feed drive motor . . . single lever, power selection of speeds and feeds. Horizontal machines are equipped with Dynapoise overarms to reduce self-excited chatter . . . plain and vertical machines are equipped with automatic table cycles. Write for new catalog No. M-1917-1; or look in Sweet's for brief data.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

A high cubic removal job (1¼" depth of cut, 19 ipm feed) . . . milling the sides of heavy machine tool part on a new CINCINNATI® No. 5 Plain Dual Power Dial Type Milling Machine.



Power draw-bar attachment reduces the cost of this 12-operation job on No. 4 Vertical Machine.

Sizes	No. 3	No. 4	No. 5	No. 6
Styles	Plain Univ. Vert.	Plain Univ. Vert.	Plain *Univ. Vert.	Plain Vert.
Table travel	34"	42"	50"	60"
Motor drives: Spindle (H.P.) (D.P.)	 20 hp 30 hp	 25 hp 50 hp	 25 hp 50 hp	 25 hp 50 hp

*No. 5 Universal available in High Power Machine only

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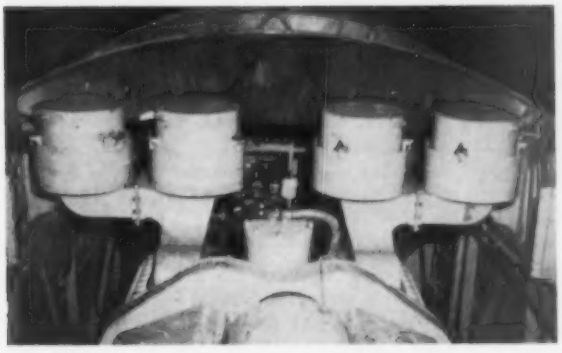
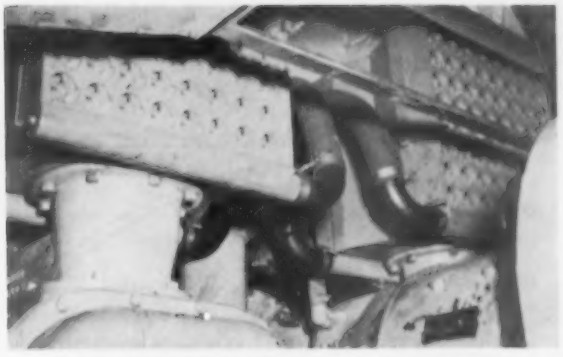
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



Two oil bath filters are mounted in tandem on each engine blower through a specially made manifold. Centrifugal filters are supported on top of the standard panel filters with an aspirator tube from each filter fitted into the exhaust manifold



What Type Air Filter?

Tests of four types were made to indicate:

- *How efficiency affects engine wear*
- *How efficiency of different filters compare*
- *The type and size particles that cause most wear*
- *Optimum cleaning periods for each type filter*
- *Possibilities of the new electrostatic filter*

Tests on the B&O have shown that the 4-in. engine air filter panel is about twice as efficient as the 2-in. filter in reducing the amount of dust passing into a diesel engine. Substitution of the 4-in. filter for the 2-in. filter reduced cylinder liner wear on a group of test engines in freight units from an average of .0065 in. per 24 months to about .0045 in. These were among the initial results described in a progress report to the Society of Automotive Engineers by Pell Kangas, special engineer in the Research Department of the B&O.

The tests were conducted on the Wheeling Division of the B&O. Relatively high wear rates occur on that division and units assigned to it stay within its confines providing uniform service and easy availability of the units for test work and inspection. The mountainous terrain has curved track that produce wheel and rail wear particles, upgrades that produce dust from sanding, and downgrades where braking produces abrasive iron dust.

The air "breathed" by the engine in such territories is naturally heavily laden with particles that cause wear directly in the piston rings and cylinder liners, and secondarily where the lubricating oil system carries these abrasives and causes wear in the crankshaft, crankshaft bearings and again in the piston rings.

It was recognized that it would be difficult to determine how far the improvement in engine filtration should be carried because each railroad has a different set of circumstances to consider. To give the results as much meaning as possible therefore the problem of choosing an improved filtration system was divided into two parts:

1. A test of all available filter systems or devices to obtain information on how much each filter improved the engine condition. This test was done without regard to the cost of purchasing or maintaining such filters.

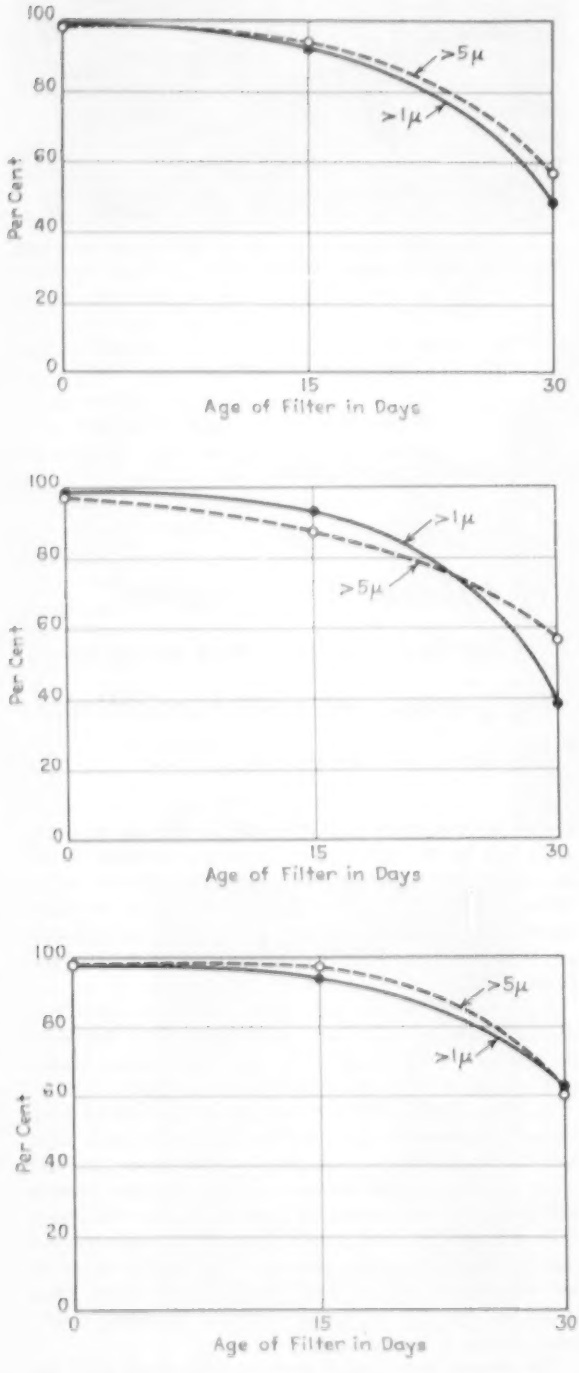
2. Upon completion of the above test period an evaluation was made of the economic aspects of each filter and the resulting benefit that accrued from its use. Wear on engine parts at one-year and two-year periods will correlate the amount of wear with filter efficiency.

In this way the cost of the filter and its maintenance can be balanced against the economic benefits from its use and a study can be made to determine which filter is the best buy for the specific railroad operating condition.

The present tests, begun early in 1955, compared the newer type air filtration systems—the electrostatic, the centrifugal and the oil bath filters—with a set of 4 in.

by 20 in. by 20-in. panel filters as a yardstick. The test and control filters were installed in four EMD F7 diesel units that were fitted with measured power assembly parts in all 16 cylinder positions.

With the four test units, the centrifugal and the oil bath filters could be compared with the commonly used panel filters, and all three could be evaluated against the electrostatic filter, which was felt to provide the optimum in dirt filtration. An engine operating with this filter provides a useful criterion with which the other three commercially available filters could be compared. The experience gained in the use of the electrostatic filter will also aid in determining the feasibility of its use as a regular filter device.



How the elapsed time since the last cleaning affects the efficiency of the electrostatic filter as measured three different ways

While electrostatic air filters have been used on occasions in passenger cars in the past this is the first such installation on a locomotive. A filter and its installation is, therefore, illustrated and described in some detail in an accompanying box.

The oil bath filter is of the self-contained type with the oil reservoir an integral part of the system. The air is drawn downward to the oil and then sharply upward to throw out some of the larger particles at the turn in air direction. Going upward the air carries oil into the baffle structure where additional dust particles impinge on the oil drenched filter element. The captured dust gravitates downward with the free oil droplets and settles into the lower section of the oil reservoir to ultimately form a sludge accumulation.

The oil level in each of the bowls is checked monthly. If the oil level stabilizes at a point no more than ½ in. below the specified level no oil is added. The sludge accumulation in the lower part of the reservoir requires removal once or twice a year depending on the service conditions.

In the centrifugal air filter air is drawn through vaned openings into each of 64 inlet tubes where the air is caused to spiral and make two abrupt changes in direction before passing through the engine air blower into the engine. The particles are removed by centrifugal action from the air and drop into a dirt bin. From here they are drawn into an aspirator located in the exhaust manifold and returned to the atmosphere with the exhaust gases.

No maintenance schedule has been established on the test unit since the exterior surfaces are relatively clean after eight months of service. When necessary the filter sections will be removed and then cleaned, first by removing the exterior accumulation by vacuuming and brushing, and then blowing the interior clean with compressed air.

The standard 4-in. impingement type filters on the control diesel unit are cleaned and dip-coated each 15 days with a filter compound made from crankcase drainage and an additive to form a tacky oil.

None of the four types of filters restrict the flow of air enough to adversely effect engine operation. The pressure loss listed in the table for the electrostatic filter included was determined with the 2-in. panel filters in position. Pressure loss solely through the electrostatic element was less than 1 in. water.

Three different types of efficiency were determined for each filter. The efficiency by particle count gives equal value or status to all particles ranging in size from 1 micron to 100 microns. Since the majority of the particles are in the 1 to 5 micron range, sizes that have been found to contribute least to wear, particles above 5 microns in size were considered separately in figure—efficiency by size.

Efficiency by particle size was computed from the particle size distribution figures for the average field. The mean size for each size range was multiplied by the

number of particles in that size range. The efficiency thus derived took into consideration the particle diameter. Only the minimum diameter of the particles was considered in these data. Since the size of the particle is directly related to wear factors, such as clearance between moving parts and oil film thickness, efficiency by particle size appears to be more a valid figure than that by count alone. This again was computed for particles above 5 microns as well as for particles above 1 micron.

Efficiency by particle volume was computed from the mean sized particle in each size range. This figure tends to give undue emphasis to the few large particles. Other studies have shown that the large particles of road dust cause less wear than those in the 20 micron region because of their fragmentation under load. Therefore efficiency by volume may be considered less useful than the efficiency by size data derived in this test.

Character of the Railroad Dust

Particle size distribution of the road dust is shown in an accompanying table. Under the microscope a large number of the particles were found to be transparent fragments of quartz. The balance are opaque particles, such as fly ash, abraded iron particles, road-bed dust, etc. Spectrographic analysis of the filter dirt reduced to ash has shown the major constituent to be silicon (ranging up to 81 per cent) and minor being iron (ranging up to about 16 per cent).

A chemical analysis of the dirt accumulated on collector cell plates of the electrostatic filter was found to consist of the following percentages by weight:

	On dry plates	On treated plates
Solubles, oil and moisture	56.0	73.5
Carbon	40.4	25.7
Sand, dirt and metal	3.6	0.8

These figures indicate that even dry or untreated collector cell plates and the ionizer ground plates collect oil from the smoke and other available oily vapors.

Filters Are Selective

How all filters except the electrostatic are selective where railroad dusts are concerned is shown in a table which compares the percentage distribution of different size particles before and after passing through each of the four filters.

The electrostatic filter data is based on an average of eight tests and shows nearly the same particle size distribution before and after the filter. The differences are not considered significant. Data for the other three filters are based on single tests and may not be representative of the general condition. The particle size distribution of the air stream dust in front of the filters reflects differences in atmospheric conditions at the time each of the filters was tested. The differences between the particle size distribution before and after each filter are significant.

How Cleaning Affects Efficiency

The three curves show how the efficiency of the electrostatic filter from three different standpoints decreases at 15 and 30 days after cleaning. Its initial efficiency appears to be in the order of 98 per cent for all curves. The efficiency by count curves are slightly lower than those for efficiency by size. At 15 days the efficiency averages around 93 per cent, representing a drop of 5 per cent in efficiency from test values obtained at the one-day condition for both curves when considering all particles above one micron. At 30 days the efficiency values range below 60 per cent.

The curves for the efficiency determinations are shown separately for particles greater than one micron in diameter and for particles greater than 5 microns for each of the three efficiency calculations. The paired curves for the efficiencies by size and by volume are very nearly the same. Similar curves for efficiency by count show a greater variation whereas the 5 micron curve is about 6 per cent less at 15 days and about 20 per cent more at 30 days than the 1-micron curve.

The range of values of efficiency for a given filter age was considerable. For example, at 15-day filter age the 5 values for efficiency by size ranged from 79.6 to 97.4 per cent (average of 93.4 per cent) for particles greater than one micron and the range was from 89.2 to 98.4 per cent (average of 94.1 per cent) for particles greater than 5 microns. Similarly at 26 to 30 days the two values for efficiency ranged from 31.8 to 67.0 per cent and 39.6 to 85.9 per cent.

A single test was made which showed that the efficiency of treated collector plates was not significantly better than that for dry collector plates. It is possible that the railroad atmosphere contains oily vapors in amounts sufficient to treat the dry plates in the electrostatic filter. Further testing would be necessary to establish the efficiency of a dry or untreated filter.

What Determines Efficiency

The efficiency of the electrostatic filter is a function of factors peculiar to the railroad atmosphere in addition to:

1. Voltage supplied to the ionizer and collector plates
2. Air velocity through the filter
3. Particle size of the dust
4. Design of the filter components
   - (a) length of the collector plates
   - (b) spacing between the plates
   - (c) ionizer design
5. Potential between charged and grounded elements of filter
   - (a) dirt accumulation on ground plates
   - (b) reduction of corona discharge from charged wires in ionizer causing reduction of electrical charge on dust particles
   - (c) reducing ability of collector to capture particles having reduced charge

The drop in efficiency with time is related to the amount of oily carbonaceous accumulation on the ground plates in the ionizer and in the collector cells which caused a drop in the potential between the charged and grounded plates. Therefore, some single tests were conducted where the age of the ionizer and the collector cells were varied with respect to each other. The efficiency values derived from a test using 15-day ionizer and 30-day collector cells were less than those when both filter components were 15 days old. Further, the efficiency values for the reverse, a 30-day ionizer and 15-day collector assembly, were still lower, although higher than when both filter components were 28 days old. Appar-

ently age, reflected as dirt accumulation, affects all components but the ionizer is more sensitive to dirt accumulation than the collector cells.

Engine Uses More Air Than Thought

Air velocity through the electrostatic filter was measured using an anemometer. At the 8th or full throttle the average velocity at the face of the 2-in. panel filter on the ionizer was 1,370 fpm. Without the filter it was 1,200 fpm. The filter equipment was designed to operate at a maximum velocity of about 900 fpm, based on the builders data on engine air requirements of 2,750 cfm per blower. Apparently the actual air intake for this engine is somewhat greater than the value usually given. Because of this discrepancy in air velocities the efficiency of the electrostatic filter was consequently reduced.

Preliminary measurements of efficiency by the count for the centrifugal, oil bath and panel filters have been made. However, the method for evaluating these filters for efficiency needs further study since the air velocities at the points where the downstream samplings were made were not determined. It is possible that the microscope slide impingement method will be difficult to adapt to the centrifugal and oil bath filters because of their irregular air flow patterns. More field work on these filters is planned to gain more precise data on their efficiency in regular service and in the effect of air flow velocity on filtering efficiency.

Although these tests are concerned with air-borne dusts, their filtration, and the wear caused by such dusts, it should be noted that another source of wear is also present. After the diesel engine has been exposed to the normal railroad dust and grime in regular service, some air-borne abrasive particles find their way into all its interior surfaces and parts. Such particles included in the sludges and lighter films are not harmful if they are not disturbed. Anything disturbing these particles, such as changing the crankcase oil, changing the oil filters, wiping and cleaning activities, use of solvents, and dilution of the lubricating oil through fuel oil leakage, will release these dormant particles into the lubricating oil system and thereby increase wear throughout the engine.

The final evaluation of the test filters will be made after the 12-month and 24-month wear measurements are available. In the meantime proper cleaning, frequent change-out of the 4-in. panel type air filters is necessary to provide all possible protection to engines until better air filters take over.

Comments on this test ranged from suggestions on how to speed it up and make it more meaningful to adding information learned from other tests.

An EMD spokesman pointed out that there is no evidence that the present types of filters—panel, oil bath and centrifugal—do not protect the 567 engine adequately. While the electrostatic filter described is the first such applicaton to a locomotive, it has been used in passenger cars in the past but was discontinued because of excessive maintenance.

Another comment pointed out that wear on power assemblies is not now the governing factor in repair periods. However, as other maintenance problems are licked, this wear may soon be dominant, in which case better air filtration will become more important. Extend ing the 15-day maintenance period on the electrostatic filter to the 60 or more days on other types would make it more competitive.

Tests have also shown that filters begin to lose efficiency when the weight of the dirt accumulated approaches three times the weight of the fresh adhesive—also that the total weight of the dust particles is not the entire factor in the cause of wear. Variations in the percentages of the various size in the total composition can cause marked differences in wear rates.

The wear rate is affected also by the location of the air inlet and whether the units are shuffled around or not. The first unit gets clean air while the following ones get its sand, dirt and other abrasive material into their engines.

Placing the collector slide perpendicular to the air flow can give a false indication. As the air stream is deflected around the plate, a smaller ratio of large than of small particles will make the abrupt change with the air stream. Thus there will be a greater percentage of large particles on the slide than actually exist in the air stream.

One objection voiced to the type of test conducted by the B&O was that it will take two years to complete and will be applicable primarily to one district on one rail-

Table I Particle Size Distribution of Railroad Dust

Particle, size range, microns	Percent by Number maximum	minimum	Average
80-200	0.1	0	0
40- 80	1.4	0	(0.4)
20- 40	9	1	3
10- 20	14	1	6
5- 10	20	4	9
1- 5	94	61	82

Percentage Distribution of Different Size Particles of the Dust Impinged on Slides Placed Before and After the Filters

Size range in microns	Filter Before	After	Centrifugal Filter Before	After	Oil bath Filter Before	After	4-inch panel filter Before	After
1 — 5	87	89	96	99	56	99	71	93
5 — 10	7	8	3	0.8	12	0.2	22	4
10 — 20	4	2	1	0.2	15	0.4	6	2
20 — 40	2	1	(0.4)	0.0	13	(0.2)	1	1
40 — 80	(0.3)	(0.1)	(0.1)	0.0	4	0.0	(0.1)	0

Comparison Chart of the Four Types of Filters

Type of filter	Maintenance frequency	Pressure drop — Inches water Idle	Full load
Standard Panel type	Clean every 15 Days	Under 1 in.	2 in.
Electrostatic	Clean every 15 Days	Under 1 in.	3 in.
Oil bath	Check oil level monthly — clean once or twice a year	2.2 in.	13.2 in.
Centrifugal	None after 8 months	1.1 in.	8.4 in.

road. The use of radioactive material to conduct the test would cut the time and make the result meaningful for more areas. The slowness of the wear rate makes for long delay when measured other than by the radioactive method. Its use would allow many conditions to be investigated in a short time.

Dirt Collection and Measurement

The dust-collecting ability of a filter was measured by examining a sample of dust collected by impingement on oiled microscope slides that were placed in the air stream both before and after the filter. This method worked best for test positions where the air stream velocity was similar at both locations, which was true for the electrostatic filter and the 4-in. panel filter.

The 1 in. by 3 in. microscope slides were permitted to "ride" for 80 to 300 miles after which they were carefully removed, and examined under a light microscope in the laboratory. The magnification permitted counting particles ranging upward from one micron.

The particle count provided particle size distribution data which permitted studying size selectivity characteristics of the filters. Efficiency was calculated by determining the ratio of the number of particles impinged on to outer and inner slides, by number, size and volume. The formula used in making this calculation was:

$$E_n = \left(1 - \frac{S_2}{S_1}\right) \times 100\%$$

where, E_n = efficiency by number, percent

S_1 = particle count per average field on slide placed before the filter.

S_2 = particle count per average field on slide placed after the filter.

Thus, if the particle count were 500 before the filter and 50 after it on a given trip, the efficiency by number would be:

$$E_n = \left(1 - \frac{50}{500}\right) \times 100\% = (1 - [0.1) \times [100\%$$
$$= 90\%$$

The same formula was used to compute the efficiency three different ways—by size, by volume and by count.

How About This Electrostatic Filter?

The schematic diagram shows how the electrostatic air filter is positioned in the carbody. The filter consists of two units, each with an ionizer section and two collector cells.

A power pack located in the dynamic brake hatch provides 12.8 kv. to the ionizers and 5.8 kv. d-c current to the collectors. The power pack, in turn, is supplied with 110-volt a-c, 60-cycle a-c by a 500-W motor-generator operating from the locomotive's 64-volt d-c current. The rated input of the power pack is 3.7 amps, with a maximum load of 350 watts.

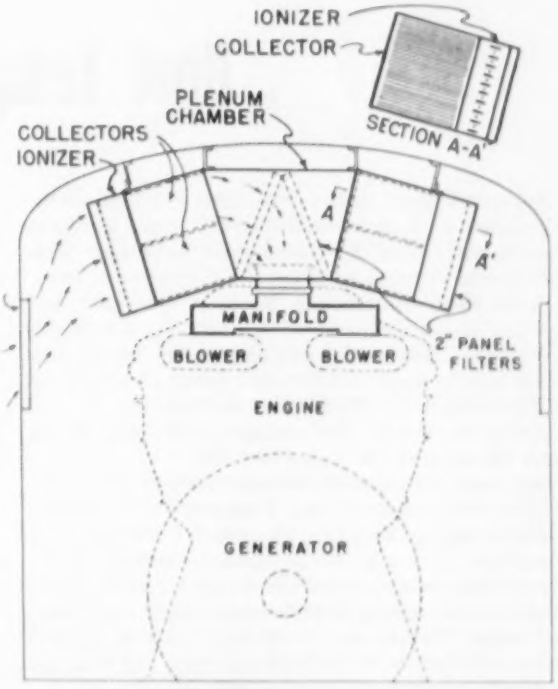
The ionizer consists of tungsten wires alternated with aluminum strips. In operation the tungsten wires are charged and the aluminum strips are grounded. The function of the ionizer is to electrically charge all particulate matter passing through its frame.

The collector cell is made up of a series of aluminum plates. Alternate plates are charged electrically and grounded. The function of the collector is to collect and hold the particles initially charged by the ionizer.

Standard panel filters, 2 in. by 19½ in. by 24½ in., were fitted in front of the ionizer to prevent large foreign objects, such as insects, leaves and cigarette paper, from getting into the filter and causing a short across the collector plates. Two such panel filters were also placed behind each collector as protection in case the electrostatic filter became inoperative.

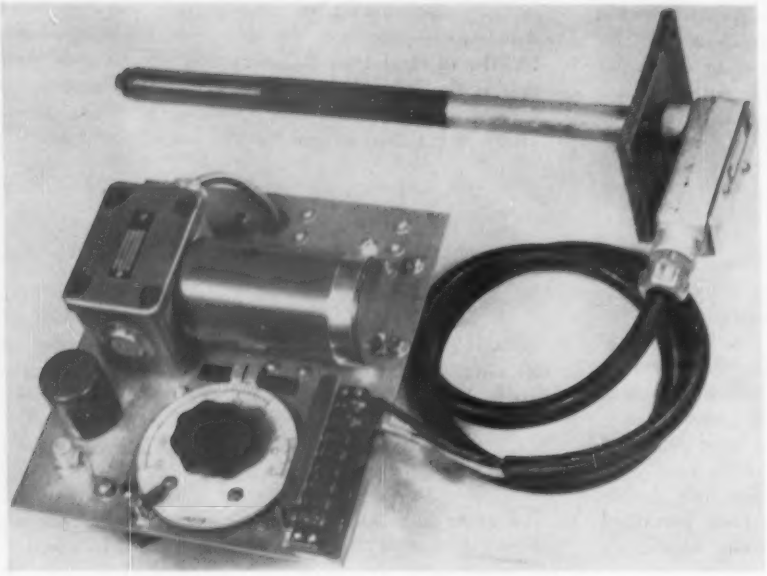
Since the electrostatic filter was specifically designed to fit in the space over the engine air blower all available space was utilized. To save space for the collectors and solve the problem of locating air ducts to the blowers, a common plenum chamber and manifold to the air blowers was incorporated in the design. The electrostatic filter assembly was suspended from the main roof hatch while it was on the shop floor. The air manifold was attached to the blowers and the connection between the manifold and plenum chamber was made with a flexible duct. The power pack and the motor generator were installed in the dynamic brake hatch.

The maintenance schedule for the electrostatic filter in service is based on the efficiency tests that were conducted. The schedule is adapted to the regular shop maintenance practice for diesel locomotives. The entire filter assembly, ionizers, collector cells and 2-in. panel filters are removed every 15 days, and a clean duplicate set is installed.



Cleaning of the dirty ionizer and collector cells is done by a steam jet gun, drawing a soap solution designated for cleaning aluminum parts and water for rinsing. One man operates the steam jet gun and the second man manipulates the filter parts.

The collector cells are coated with filter treating compound by the dip method one day before installation to permit the excess treating compound to drip off. The ionizers are not treated. Applying an adhesive compound to the collectors provides a means for holding the dirt particles mechanically.



Temperature maintained by the Vapor unit (left) is from 1½ deg below the setting to 1½ deg above it. With the same setting on the selector . . .

How Temperature Controls Work

More and more of you will be coming in contact with mechanically refrigerated cars as their numbers continue to increase—at least to the extent of having to interpret instructions accompanying the car and deciding whether you should allow the car to proceed or to call a service man. A key factor in making this decision will be an understanding of the fundamentals of the control system. This article explains the different types of basic controls for "All-Purpose" cars and for "Frozen-Food" cars and the service for which each type of car is suited.

Automatic control systems—the heart of the mechanical refrigerator car—are divided into two broad categories like the cars themselves. The controls furthermore make the essential difference between the two types of cars.

Frozen-Food cars have simplified controls which only maintain the car temperature below zero. The All-Purpose car, on the other hand, can maintain any temperature within a wide range, usually from below zero to about 70 deg. It therefore offers provision for heating as well as cooling the interior (for example, to maintain 40 deg inside the car when it is zero outside).

Both cars have essentially the same refrigeration equipment—a diesel engine driving a generator that furnishes current to motors that drive compressors and fans. The frozen food car has all the mechanical equipment necessary to being an all-purpose car except a control system capable of maintaining accurate temperatures in the fresh food range. (Usually around 32 deg.) Early mechanical reefers were largely frozen food cars only, and this type car is still receiving some consideration.

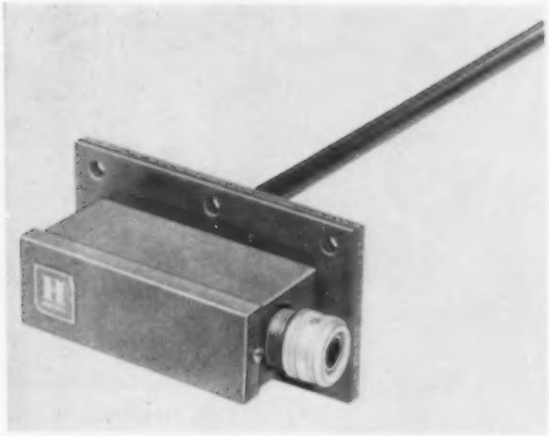
Commodities for which the frozen food car is intended need merely be kept below a certain temperature (usually around zero). They suffer no damage if kept substantially below the maximum allowable. Fresh foods must, however, be kept substantially above zero and within a rather narrow temperature range.

Which Type Control?

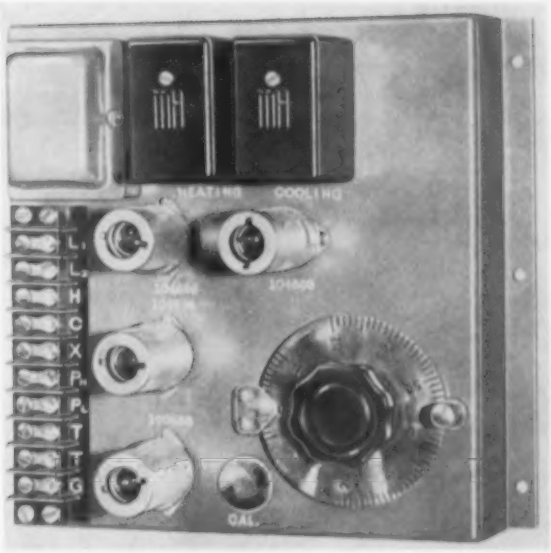
Two principal types of controls for All-Purpose cars are the electronic systems available from Minneapolis-Honeywell and the magnetic amplifier type manufactured by Vapor. Both controls have an upper range from about 20 deg to 70 in which both cooling and heating are controlled. The lower range goes from plus 5 to minus 10 deg and controls cooling only since heating is not needed with frozen foods—for them, the colder the better.

Either type maintains temperature in the upper range within a total variation of three degrees. Temperature selector dials on both types are graduated in one-degree increments and have a locking screw to prevent accidental resetting. Both types have a negligible power consumption.

While both systems are designed to maintain temperature within a total range of three degrees, the variation around the setting is slightly different. If the M-H unit is set at 32 deg (see drawing) heat comes on at the set point until the car reaches 1½ deg above the setting. If it is colder than 32 outside the car, the temperature will fall eventually back down to 32, at which heat comes back on until 33½ deg is again reached. If it is warm outside, say 60 deg, cooling will cut in just below 35 and cut out just below 33½.



A slightly different temperature range is maintained by the Minneapolis-Honeywell control—from the setting to 3 deg higher in the upper range and from the setting to 1½ deg colder in the lower range.



In Mechanical Refrigerator Cars

Thus, this control maintains temperature from the setting to 1½ deg above it when heating is needed. When cooling is needed, it cycles from 1½ deg to 3 deg above the setting. The overall range is from the setting to three degrees over it when the setting is in the upper range. In the lower range cooling begins at the set point and continues to 1½ deg below it. Thus, in the lower range the temperature never rises above the set point as it does (up to 3 deg) in the upper range. The reason for this is that a few degrees cooler for frozen commodities does no harm. On the other hand, with fresh food shipments, in the vicinity of 32 deg, the temperature cannot drop below the set point to subject the cargo to freezing temperatures in this critical range.

The Vapor control likewise maintains a 3-deg range, but it cycles from 1½ deg below the setting to 1½ deg above it. Placing its selector at 32 would maintain from 30½ to 33½ deg. Apparently the magnitude of the temperature range with either control is essentially a function of the refrigeration rather than the control system. Controls can be made more sensitive. The 1½-deg differential is necessary to avoid cycling between heating and cooling that could result from carryover of either action.

Features of Control Systems

Both systems have their advantages. Vapor, for example, feels that the magnetic amplifier in conjunction with a wheatstone bridge circuit is better able to withstand train jolting and vibration than controls using electronic tubes. Minneapolis-Honeywell emphasizes the "fail safe" feature of the electronic controls and considers them more accurate. If a failure develops in the M-H control, neither heating nor cooling is called for. Here are some other characteristics of the two systems.

The Vapor control system consists of two parts—the magnetic amplifier mounted on a metal panel with a temperature selector and a thermostat probe tube. The temperature sensing element of the control is a Vapor Thermistor thermostat located at the end of a brass tube probe which is installed in a heating or cooling air duct where it is wiped by circulating air. The thermostat thus senses the temperature of the air in the duct and the magnetic amplifier enlarges the small electrical current from the thermistor, thus causing the mechanical cooling system to increase or decrease cooling output or heat output as needed to keep the car at the predetermined temperature setting.

A protective 30 to 45 second delay feature has been designed into the control to keep the refrigerating system from cycling on and off for 10 or 20 seconds at a time, which would be hard on the refrigerating systems. A heat lock-out feature keeps the heating systems from going on at any inside temperatures below 22 deg above zero.

The control is mounted on a 7½ in. by 9 in. cadmium plated metal plate designed to fit into the various types of electrical panels of mechanical refrigerating systems. It operates on 220-volt a-c current provided by the refrigerating system but is not affected by voltage variation from 220 to 250 volts.

Principle of Electronic Operation

The electronic control system consists of a resistance thermostat mounted in the refrigerated space and a compact electronic panel mounted at any convenient loca-

tion. The thermostat consists of a bobbin wound with wire which is very sensitive to temperature changes. The thermostat is used as a remotely located leg of a wheatstone bridge circuit in the panel. This circuit is then balanced out when the temperature in the car is equal to the desired temperature set on the panel. When in balance, the panel will call for neither heating nor cooling and no demands are made on the heating or cooling circuit.

As temperature in the car begins to deviate from the set point, the change in temperature affects the extremely sensitive element of the thermostat. The electrical resistance of the wire wound bobbin is changed and the bridge circuit is upset, or thrown out of balance. The panel determines whether the minute bridge signal was caused by an increase or decrease in temperature, and amplifies

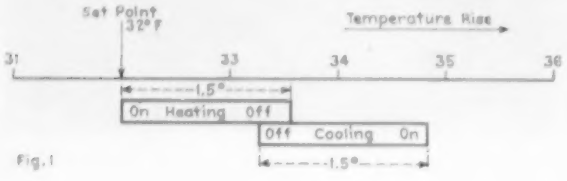


Fig. 1

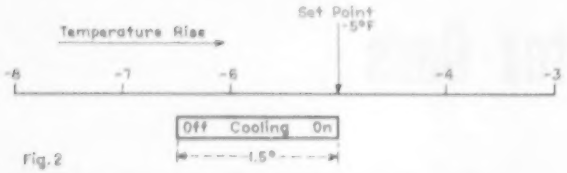


Fig. 2

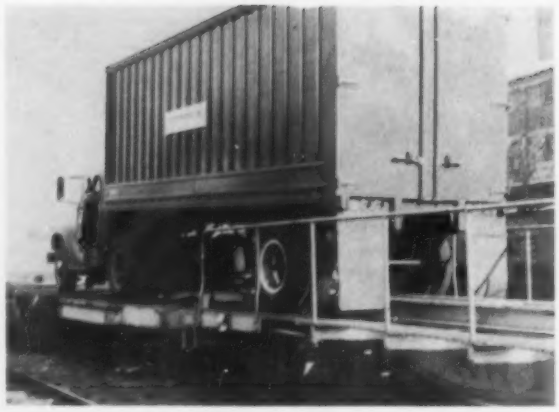
the signal until it is able to pull in the necessary heating or cooling relay. As soon as the temperature returns to the desired setting, the thermostat will also sense this and cause the appropriate equipment to be shut off.

One specific panel made by Minneapolis-Honeywell incorporates a time delay relay circuit for operating two stages of cooling. This circuit enables two stages of cooling to be utilized, but will start only one stage at a time, delaying the starting of the second stage 30 to 60 seconds. This feature prevents overloading the car's electrical circuit which might occur if two compressor motors were started at the same time.

The "Fail Safe" feature of electronic control is based on the theory that a well-insulated mechanical refrigerator car maintaining frozen temperatures can maintain a safe temperature for periods up to 24 hr in the event of a cooling failure.

Why Control Is Critical

The importance of controlling temperatures accurately is emphasized by U. S. Department of Agriculture recommendations which list 26 different temperatures (and temperature ranges) for optimum preservation of various fresh fruits and vegetables. Some of these ranges are limited to only one or two degrees, requiring the control system to hold the set temperature very closely. In addition, many other temperature settings are recommended for meats, fish, dairy products, biological products, etc., and still different temperatures to encourage ripening of various fruits in shipment.



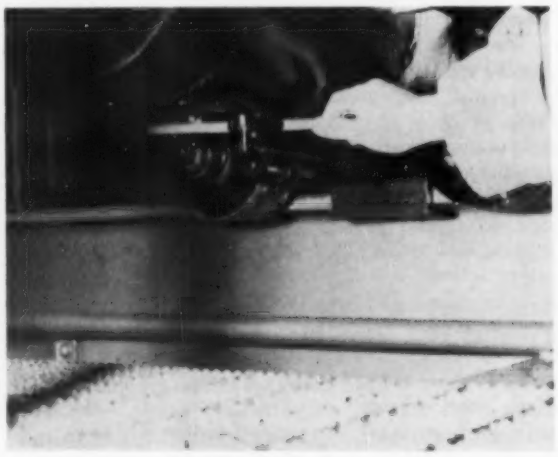
Jockeying the trailer into position for backing onto the car is eliminated by a centering ramp which lines up flanged steel wheels on both the trailer and the tractor with the center sill. Once on the car the tractor and its trailer are supported on two pairs of steel wheels each, none of the tires touch the car.

Basically the car is a hefty 75-ft. center sill with a catwalk on either side plus tie-down arrangement and extra cushioning against longitudinal shocks.

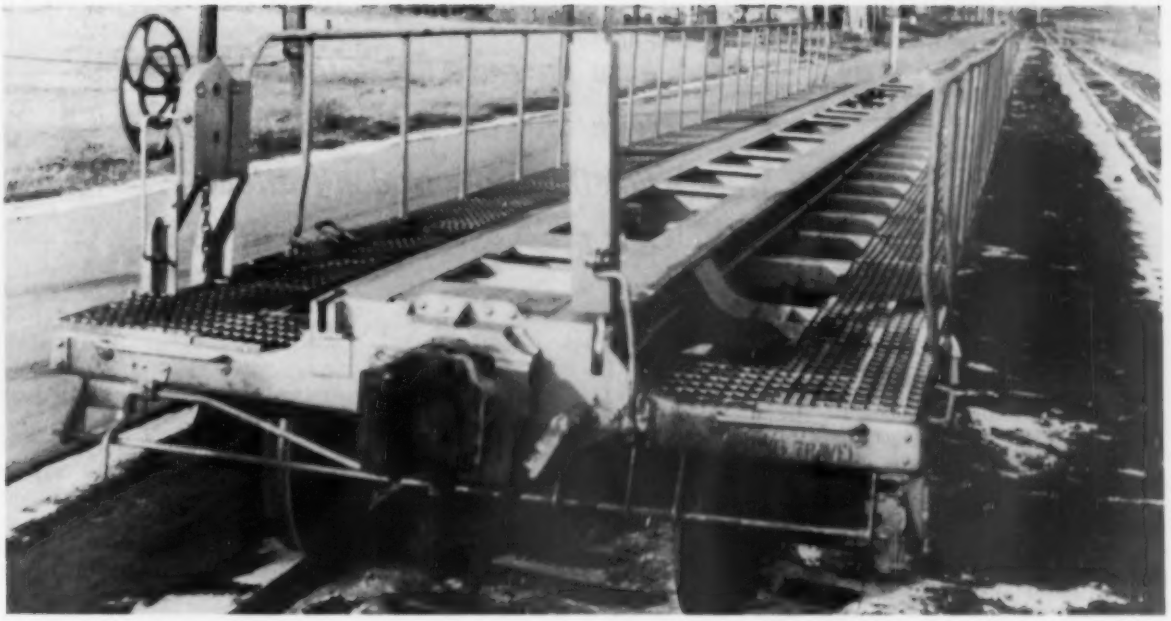
550 French-Type

The first order for a French design piggyback car that can be loaded or unloaded in about a minute has been placed by the New Haven. That road is buying 550 such cars from Pullman-Standard built to a design and patents of Piggy-Back, Inc., an American affiliate of a French carbuilding corporation. Features of the 75-ft. car, which weighs but half as much (50,000 lb) as the same length flat car are:

• The trailer rides 8 in. lower than on a flat car, improving clearance conditions and lowering the center of gravity.



Existing trailers can be adapted to the system with relatively simple additions like the above modification to a landing gear. In this case, clamping is to the under side of the center sill flange rather than the inside of the wheel.

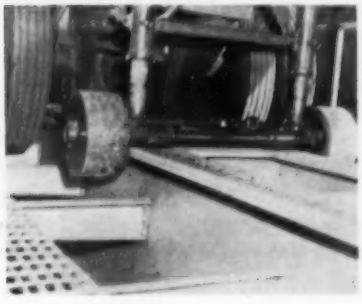


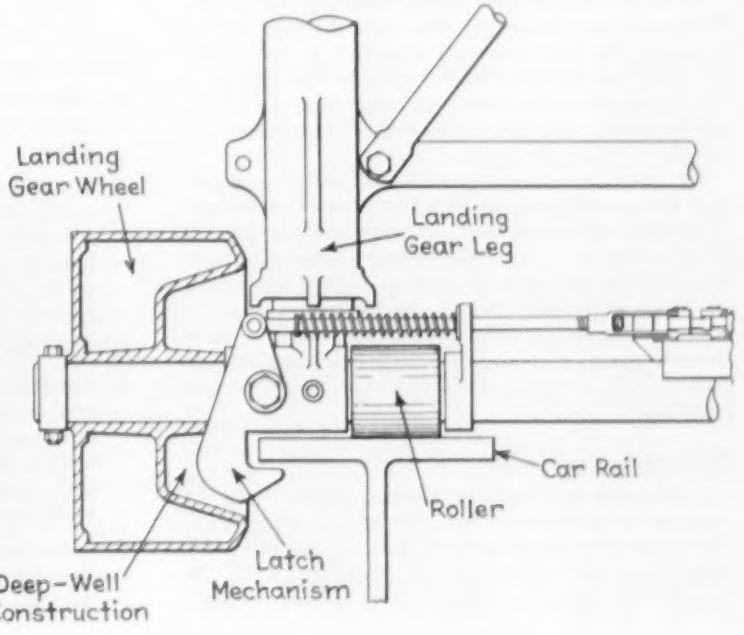
Piggyback Cars To Ride U. S. Rails

• Elimination of wear on trailer tires and wheel bearings as the tires are suspended over the car frame.
• Reduced coupling impact because of longitudinal shock absorbers between the trailer and the car.
• No alignment problems even in loading long strings of cars. A centering device, which lines up the flanged wheels on both tractors and trailers to the "rails" on the car and to bridges between adjoining cars, permits high-speed movement backward for loading or forward for unloading.

These "rails" are two steel I-beams 75 ft. long placed side by side, whose other purpose is to form the main body of the car. Their outer edges are 39-in. apart to conform with the standard inside wheel width of trailers. At either end of the car is an adjustable rail that rides locked in a vertical position while the car is in motion. Lowering this rail by a handcrank from the ground places it in coupling position. When both coupling rails are lowered they form a bridging rail from car to car permitting end-loading over an entire string of cars.

The "landing gear" on which the front of the trailer rests when on the ground is supported by the tractor when loading. The purpose of the rollers is to permit longitudinal movement resulting from the car shock absorbing mountings. Locking in place is by a hand-operated lever that clamps to the recess in the wheel.





ICC Safety Regulations

- *Where they are not followed properly*
- *Where they are being misinterpreted*
- *What they do and don't allow*
- *What proposed revisions will do*

Some straight talk on where railroads are not complying fully with ICC safety regulations and what the deviations can lead to were made by F. C. MacDonald, assistant director of the section of the railroad safety of the ICC, during a talk before the Northwest Carmen's Association.

Following his talk Mr. MacDonald gave direct answers to questions from the audience on just what the railroads can and cannot do under present rules. He also cleared up the intent of the proposed revisions currently being circulated among railroads and employees for suggestions preliminary to action by the ICC. The basic purpose of the proposed revision, he said, is to clear up questions on the provision for cars of unspecified construction. The revision will attempt to provide specific requirements for types of equipment which were few in number when the rule was written but have since come into general use.

Few, if any, radical changes are included in the proposed revision. Specifications for the newer types of equipment will largely follow the pattern that has developed during the period they have been in use rather than introduce new requirements. The intention is to recommend that no modification be required of existing equipment which conforms to present safety rules.

Joint Repair Facilities

Turning to the problems arising from interchange, Mr. MacDonald pointed out that when a car develops a defect in transit, the only movement allowed is by the carrier on whose line the defect developed—and that movement must be directly to a point on its own line where repairs can be made—and then only when such movement is necessary to make the repair.

The law does not specify who shall make the repair after the movement is completed. It is assumed that another carrier or agency may make the repairs if no additional movement is involved. Where a common repair point is used and owned by two or more roads jointly (as at an interchange point), the repairs for any one of the owning and operating roads may lawfully be made there. However, movement to such repair point may be made *only by the carrier upon whose line the car became defective.*

Barriers Are Deliberate

It is readily apparent that the law effectively sets up a barrier at each interchange point beyond which a car with a defective safety appliance may not go. In fact, it makes both the delivering and receiving carrier responsible if a car with a defective safety appliance is interchanged, at times assessing "double penalties" for such dual violations.

A carrier receiving a defective car may disconnect it from other cars in refusing to accept so that it may be delivered back to the connecting carrier. This would not be construed as hauling the defective car for purposes of the penalties of the act. In fact such incidental handling of the car is considered a necessary step in furthering the purposes of the act.

When a defect is not discovered until the car is offered in interchange the delivering carrier has already violated the law. For the receiving carrier to avoid violating the law also, necessary repairs must be made before the car is accepted. For this purpose the car must be moved to the nearest repair point on the carrier's line where the car became defective.

A joint facility may make the repairs if the car is not moved either from, or past, a point where repairs could be made. If a defect is discovered during delivery, the car must be switched to the joint repair track by the delivering carrier—not the receiver. The only movement allowed the receiver is the incidental switching to separate the defective car from other cars. The receiver further may place the defective car on a joint repair track only where such a move will require no more handling than would otherwise be involved in refusal.

To clear up additional details on this and other subjects covered by ICC regulations, Mr. MacDonald answered questions from the audience as follows:

Q. Can a carrier accept a car with a penalty defect, make the necessary repairs and receive the car?

A. Yes, if it is not moved by the receiving carrier before repairs are made. When a car with a penalty defect is delivered to your interchange track you may avoid liability either by (1) repairing the defect before moving the car, or (2) by disconnecting the defective car with a minimum of switching.

Q. Can the car be moved to our repair track?

A. Generally such movement would violate the law. However, repairs can lawfully be made if the receiving carrier establishes a repair track next to its interchange track so that in switching a defective car out of the cut no more movement is involved in placing it on the repair track than on any other track.

Q. Does any further movement of this car before repairs (even on the rip track) subject it to penalty?

A. Yes, and in many cases this can mean that all cars on the repair track must be repaired before a certain one can be removed.

Q. On a joint interchange track where one road receives a defective car is it all right for them to go ahead and repair this car if it is not moved?

A. Yes, and what may and may not be done can be illustrated by a hypothetical case. Assume the GN and NP have yards several miles apart, and each has a track for receiving interchange cars with a repair track alongside. Suppose the NP is delivering a train to the GN and a car develops a defect en route which is discovered by the NP. Under these circumstances the NP can switch the car to the GN repair track without penalty to either carrier. But delivery to the GN interchange track renders the NP subject to penalty.

Q. What could the GN do in that case?

A. The GN can switch the car out of the cut without penalty. The car can be moved to the repair track if no more movement is involved than to any other track where the car can be isolated.

Q. Could the GN refuse the car?

A. Yes. However, if a repair track is immediately adjacent to the interchange track the car may be placed on that repair track if this requires no more movement than to isolate it on any other track. But the defective car may not again be moved even to switch out cars that have been repaired.

Q. Does it make a difference whether a car is an empty or a load?

A. No.

Q. Does the repair track have to be right opposite the interchange track or can the car be moved 8 or 10 blocks down into the repair track?

A. It can be located so that a movement of 10 or 15 car lengths is necessary to isolate the defective car. If this movement is no greater than needed to place the car on another convenient track, it would not be subject to penalty.

Q. What is the difference between the term, "reportable defect" and "penalty defect?"

A. An old air date would be merely a "reportable defect" as there is no law that stipulates maximum time between cleaning dates. The AAR has set up an interim which is recognized by the ICC. Brakes that are operative but beyond the cleaning time are merely reported. A penalty defect on the other hand is any condition of a safety appliance contrary to a requirement of the safety law.

Q. Is a broken retainer pipe a penalty defect?

A. No, as nothing in the rules require a retainer valve. However, as they are necessary to the air brake in some parts of the country, they are reported when found defective.

Q. How about a bent hand hold?

A. Generally any hand hold clearance of less than 2 in. is a violation of the law. Whether penalty defect would be attached depends largely upon circumstances. Wires attached to hand holds and sill steps frequently result in violation of the law.

Q. In a multiple shipment, say four or five loads on flat cars, how many hand brakes must be operative?

A. The law states that in handling long commodities requiring the use of more than one car, hand brakes may be omitted on all but one of the cars combined for such purpose. That provision took effect before continuous welded rail, a shipment of which may require 40 or 50 cars. Of course a single hand brake on such a train would be entirely inadequate. Many drop end gondolas and some flat cars have hand brakes at the side and eliminate the need for omitting the hand brakes. In the new safety appliance order it is proposed that the hand brake operating device be installed at the corner of the car.

Q. Should piston travel on all freight cars be 7 to 9 in.?

A. That limit applies only to standard equipment on freight cars. Many cars are in service with brakes on which that travel would be wrong.

Q. Is it a penalty defect for a refrigerator car to have the sill steps immediately underneath the side door broken or missing?

A. No, there are no requirements relative to the sill steps at the side doors of freight cars, nor do the rules cover dome ladders on tank cars.

Q. How about the end sill steps on Canadian cars?

A. The Canadian safety appliances require an additional end ladder tread below the bottom of the body of the car.

Q. If that sill step is broken, is that a penalty defect?

A. No, but the inspector would expect you to make proper repairs.

Q. Does the ICC prohibit welding the safety railing bracket attaching the safety railing bracket to the tank by welding?

A. No. the law only requires that the safety railing shall be fastened securely to the tank or tank bands.

Identifying Controlled-Clearance Bearings

The Pennsylvania has simplified the identification of controlled-clearance bearings by using a paint code. Stock bearings of three diameters maintained for each journal capacity are painted on the lug ends for rapid identification. The A-1 bearings are painted red, the A-3 bearings are painted white and the lugs of A-5 bearings are painted yellow. Interchange Rules require that the actual internal diameter in inches be stamped on the top or on the lug, but the color coding speeds selection of the proper bearing and lessens the chance of applying a wrong size.

Car Loading—— *Some things you can and cannot do*

During a paper before the Car Department Association of St. Louis, H. L. Hewing, superintendent of interchange, The Chicago Car Interchange Bureau, called attention to:

"Failures and accidents . . . which indicate that local mechanical department supervision and inspectors of originating carriers are not sufficiently familiar with the [loading rules] . . . with the result that shipments improperly loaded and secured were accepted from the shipper, who likewise due to unfamiliarity, oversight or carelessness failed to fulfill his required obligations. Even though the necessary amount of securement as called for in the rule or figure specification is used by a shipper, faulty or poor workmanship in its application, or inferior quality of the securement used, can and has been the contributing cause of a shipment's later difficulty, or serious accident occurring en route."

While it is the shipper's responsibility to prepare his shipment in compliance with rules, the originating carrier accepting a shipment not complying with the rules is responsible for any difficulties encountered—not only while the shipment is in its possession but until its arrival at its destination. Shippers desiring to deviate from the loading rules, or desiring approval of a method of loading and securement not now covered by the rules, must procure authority from the AAR. Further classification of these and other points covered in the loading rules came out in the following questions and answers.

Q May the shipper use additional means of securement?
A Yes, the specifications are merely minimum requirements.

Q What maximum weight of load is permitted on a single truck?
A Half the load limit.

Q What percentage of load limit may be loaded between truck center and end of car?
A 15% for each end.

Q The percentages of load limit permitted for various length loads depends on the type of equipment used. What are the four types of equipment?
A 1. Flat cars with both fishbelly type center and side sills.
2. Flat cars without fishbelly type center and side sills.
3. Drop end gondola cars.
4. Fixed end gondola cars.

Q In what type of loading or in what equipment does the 100% load limit apply?
A Loads lapped or staggered and covering about the full length of car; loads 18 ft long or over on flat cars with both fishbelly type center and side sills; and loads 24 ft long or over on drop end gondola cars.

Q What percentage of the load limit is permitted for 10-ft loads?
A 75% for drop-end gondolas and flat cars with fishbelly center and side sills; 66.6% for flat cars without fishbelly center and side sills; and 40% for fixed end gondolas.

Q When should shipments in gondola cars be secured to prevent movement toward side of car?
A When not covered by individual figures have a total vacant space in excess of 18 in. between piles, and between piles and car sides.

Q When must an idler car be used?
A When the load projects beyond end sill of carrying car or to space two carrying cars used for handling long loads.

Q May you load idler cars?
A Yes, if the ends of material loaded are not less than 2 ft. from ends of overhanging portion.

Q Where is an overhanging load measured?
A The length of an overhanging load is the distance from center of truck to end of overhang.

Q Where must lengthwise boards used to retain stakes in vertical position be nailed?
A To inside face of stakes.

Q Is the use of open end hook rods permitted?
A No.

Q What is required when rod securements are passed through floor or stake pocket?
A A 4-in. x 4-in. x 18-in. hardwood cleat or a ½-in. x 4-in. x 12-in. plate must be used under the floor or stake pocket.

Q How should nails be driven into blocking?
A Vertically, where practicable.

Q Is it permissible to use predrilled blocking?
A Yes.

Q How must band or wire securements be protected?
A Metal fillers, secured to prevent displacement, must be used to protect band or wire securements from cutting or breaking due to contact with sharp edges of car or lading.

Q What must be done to prevent nuts from working off rods or bolts?
A Threads must be nicked immediately behind single or double nuts. When only one or two threads extend beyond nuts, the ends of the rod or bolt must be riveted over.

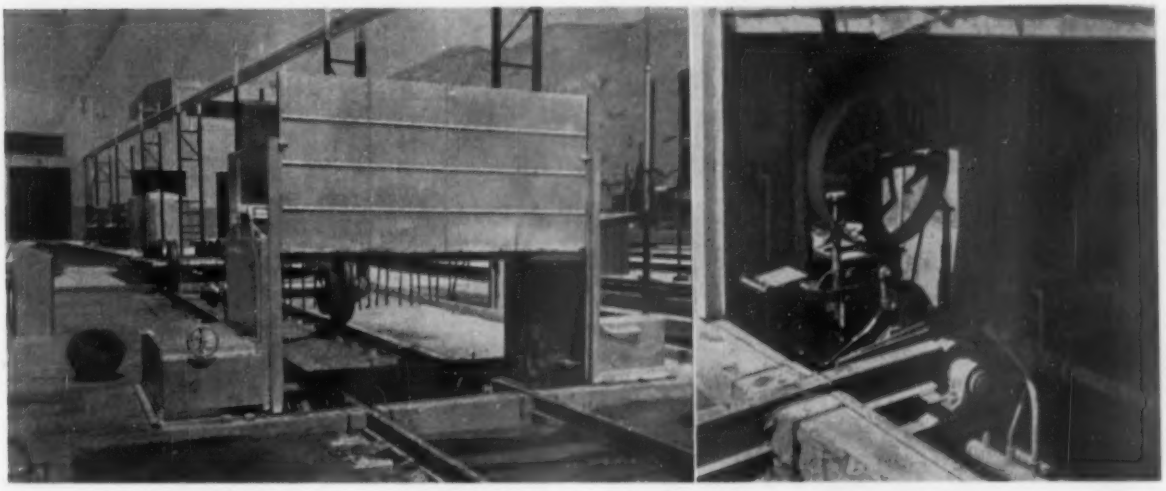
Q Are lock washers an acceptable substitute for nut locks or lock nuts?
A No.

Q Is it permissible to weld high tension bands?
A No.

Q What about welding items of securement directly to load or car body?
A No, however slotted angles, eye bolts, etc., may be welded to car body or lading for the application of load securement.

Q In loading machinery is it permissible to bolt skid to car floor?
A Skids supporting other than solid base type machines must not be bolted to car floor. Solid base type machines may be placed directly on car floor and securely bolted and blocked.

Ideas for the Diesel Repair Man...



Paxton-Mitchell wheel and bearing washer installed at Salt Lake City diesel shop of the UP

WHEEL WASHING COSTS CUT. — The Paxton-Mitchell wheel and bearing washer, described in the September 1954 *Railway Locomotives and Cars*, page 19, is currently being used to clean wheels at the new Union Pacific diesel shop, Salt Lake City, Utah, with important savings in time and cost. Mounted diesel power wheels and bearings, for example, are cleaned prior to magnetic particle inspection in 20 min. per pair and at a cost of 57.0 cents for labor; 31.4 cents for material; total 88.4 cents. This cost is cut to 74.2 cents total for the average pair of roller bearing wheels and boxes, or 59.9 cents for conventional wheels.

To review briefly, the P-M wheel washing machine consists of a closed cabinet in which adjustable high pressure nozzles direct the spray of high-alkaline railroad cleaner to the sides and top of rotating wheels. On either side of the main cabinet, there is a compartment to hold the respective journal boxes for cleaning, the boxes being spun and sprayed simultaneously with the wheels. After cleaning, steam is used to remove any alkaline cleaner left on the parts and assure rapid drying without corrosion.

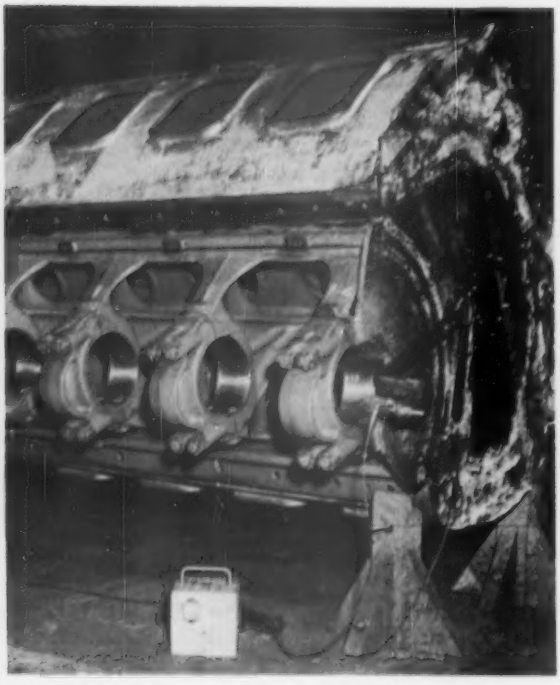
In using this machine, journal boxes are first removed from the wheels and placed in the small cabinets. The wheels are then rolled into the cabinet and the control moved to "start" position which closes the doors automatically. Inside the cabinet, the wheels start rotating as well as the journal boxes in the side compartments. The control is then moved to "pump" position which starts the washing cycle, cleaning solution sprays being directed to all parts of the rotating wheels and the journal boxes.

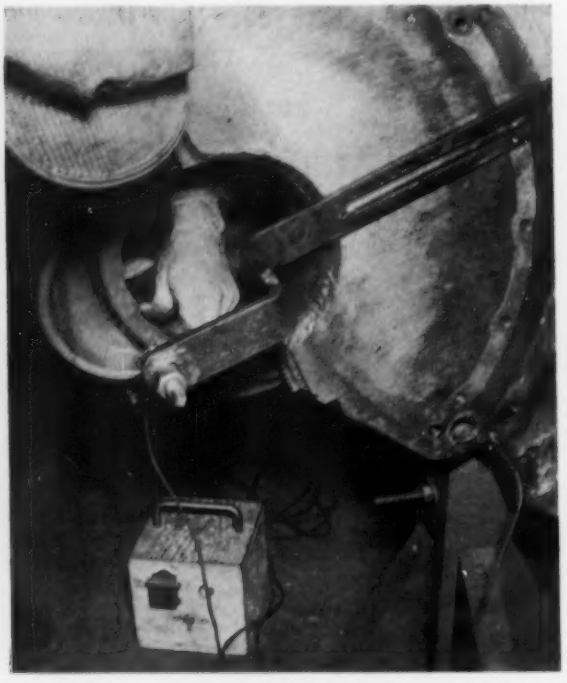
At "steam" position, the pump is shut off and cleaning solution drains to a storage tank; a valve opens and steam cleans excess solution off the wheels and journal boxes. After the parts have been thoroughly rinsed, the control is moved to "off" position which closes the steam valve automatically; stops rotation of the wheels and boxes; and opens the doors. The clean wheels are raised automatically to track level, rolled out of the cabinet and journal boxes removed from the cleaning cabinets.

While cleaning, the solution is constantly being pumped through the nozzles and drained back to the cleaning solution storage tank. At the storage tank a filter removes all solid matter from the returning solution. There is also a filter over the solution outlet which protects the pump against articles accidentally dropped in the tank past the screen filter. This equipment helps prolong the effective life of the solution.

A single control operates this modern P-M Model 240 wheel washer through a complete cycle, including the raising and lowering of the cabinet doors and the wheels. The 600-gal storage tank, located adjacent to the cleaning machine and below the surface of the ground is steam-heated and has the filter equipment mentioned.

Wheel washing tests with this machine show that it takes about 200 lb of chemical cleaner to clean 70 pairs of all types of conventional, roller bearing and diesel power wheels. With cleaner at 11 cents a pound, the material cost is thus 31.4 cents a pair. It takes one laborer 15 min to place a pair of roller bearing wheels and boxes in the washer, clean and remove them. At $1.71 per hour, this makes 42.8 cents labor cost for cleaning the average roller bearing wheels and boxes, or a total of 74.2 cents. With average conventional wheels, the material stays the same and the labor drops to 10 min or 28.5 cents, leaving a total of 59.9 cents. With average diesel power wheels, the material stays the same, but the labor goes up to 20 min or 57.0 cents to give a total of 88.4 cents. These costs are on the liberal side since they do not take into account filtering and re-use of the chemical cleaner.





Diesel engine crankcase with bearing caps in place and insulated piano wire stretched through bore to check alignment. Piano wire and electrical equipment used in checking alignment (right)

MAIN BEARING BORES QUICKLY CHECKED.— A quick and accurate method of checking the line bore of crankcase main bearings for diesel engines is now being used at a western railway shop, the time required for this operation on a 16-cylinder G-M diesel being cut from four to two hours or less.

By previous methods, a steel piano wire was drawn tightly through the line bore and an attempt made to measure with thickness gages, graduated in thousandths, how much individual bearings were "out" or spaced away from the line. The trouble was to determine with sufficient accuracy just when the thickness gage contacted both bearing and wire. It could hardly be done by sense of touch alone, especially at one of the center bearings and it was difficult to judge by sight just when the line moved. Poor light accentuated this difficulty with some of the bearings and one method which seemed to produce the best results was to use a flashlight to make the wire cast a shadow at the appropriate angle and watch for movement of this shadow when the feeler gage just touched the wire. This method gave the desired accuracy but was not positive enough and took too long.

The method now being used consists simply of the same piano wire tightly stretched through the main bearing bore, but electrically insulated; the crankcase grounded; and an electric light and buzzer system provided to give visual and audible indication when the feeler gage contacts both crankcase bore surface and the piano wire. If the machinist is in a position where he can't quite see the light, he hears the buzzer and with a little practice, this method permits checking the line bore in half the time formerly required or less and with consistent accuracy.

Equipment required for this purpose consists of a small wooden box to house a transformer which cuts shop line voltage from 117 to 6 or 8 volts ac for safe handling; a rectifier to change this to dc.; a small No. 44 electric light and a buzzer connected in parallel to give the desired signal; insulated wire leads which can be plugged into the shop electric line, and clip prods for attachment to the crankcase, and the piano wire, the latter being insulated by non-conducting support bushings in the two adjustable end brackets.

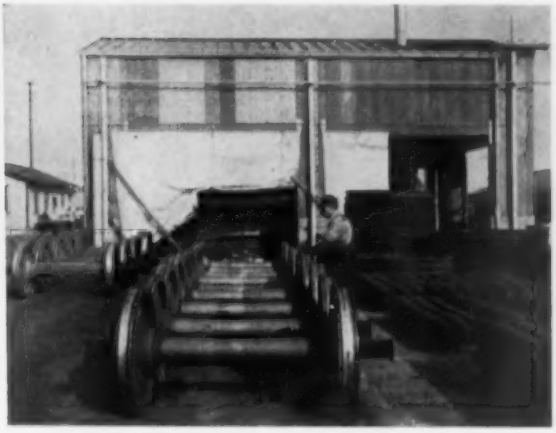
In operation, the piano wire line is run and measurements taken twice; once with the wire set and stretched .007 in. down from the end crankcase bore centers and once with the wire set .010 in. up from the end cap centers. These distances of .007 in. and .010 in. were originally selected for convenience and are now used by habit, but other locations of the wire either nearer or farther from the bore surfaces will serve just as well as long as intermediate bore distances from the wire are measured accurately and variations from the end bore distance noted. All figures are entered in a signed crankcase-bore-deflection chart which forms a permanent record for each engine in case of subsequent questioning.

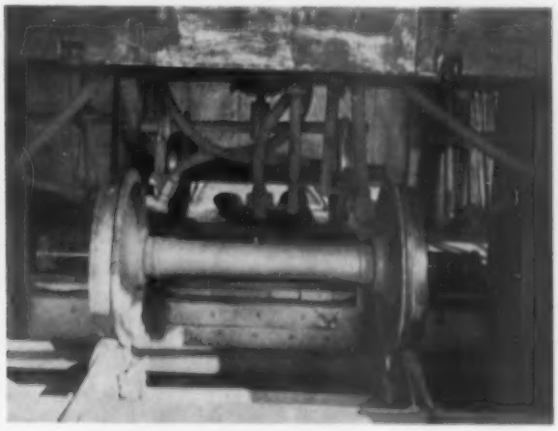
Experience indicates that bore surfaces in the main crankcase remain quite accurately in line within limits of about .0005 in. and most of the misalignment occurs in cap centers due to wear or other cause. When this

error does not exceed .003 in. or .004 in., as indicated by figures on the bore deflection chart, these figures for individual bores are checked with carefully "miked" diameters (also recorded on the chart) and the number of thousandths which must be removed from each side of each bearing cap chalked on the side.

Sometimes only three or four caps from an engine set require correction, but, however few or many, they are taken to a Micro internal grinder and this small amount of metal quickly and accurately ground off. When reassembled and suitably tightened on the crankcase, these bearing caps are as accurate in alignment and bore as called for by manufacturers' specifications.

In cases of excessive misalignment or wear, the bearing caps are closed by milling or grinding the serrated bearing surfaces and the crankcase rebored, but this operation is avoided when possible, not only to save the considerable extra time and labor involved but because it tends to shorten the service life of bearing caps and engine block as well.





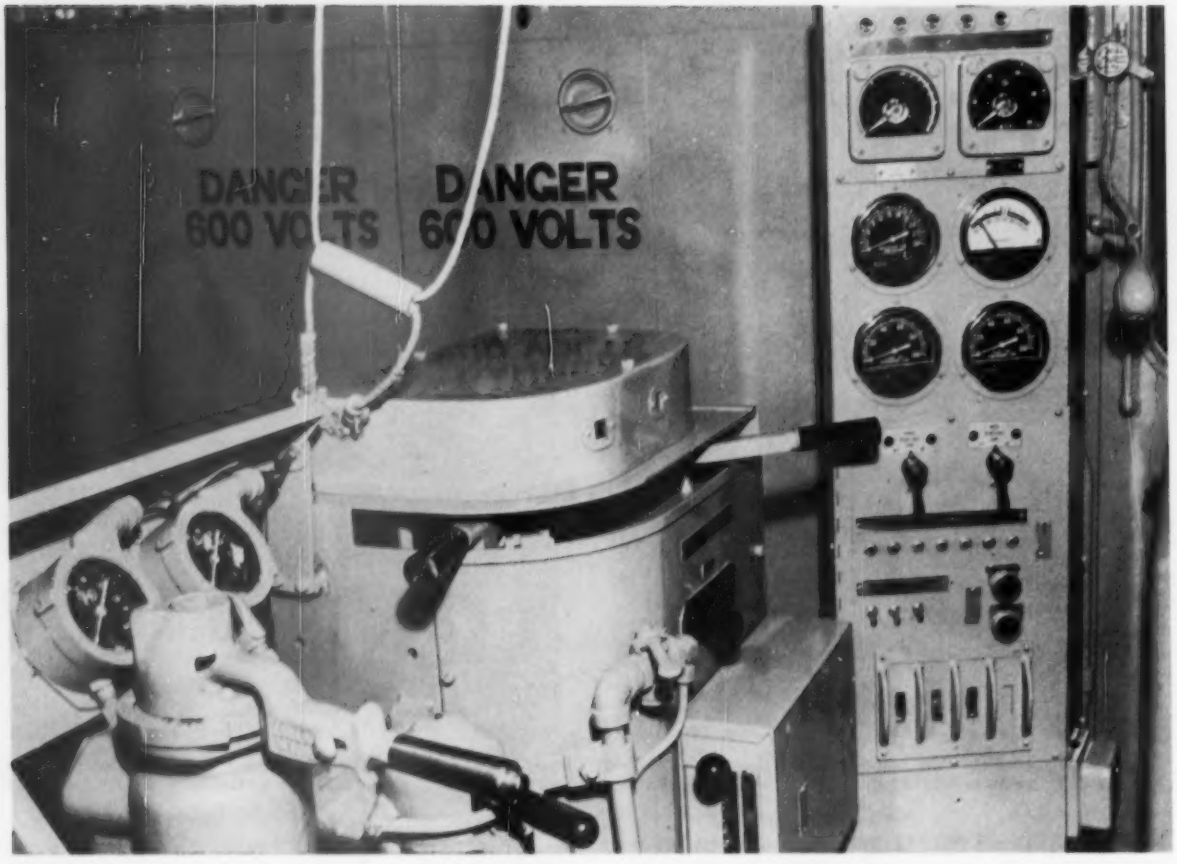
Prefabricated sheet-metal shed houses Pangborn roll-through type shot-blasting machine used in cleaning mounted wheels and axles. Right: wheels and axle assembly just ready to roll out of the Pangborn machine after being shot blasted prior to Magnaflux inspection

SHOT-BLASTING DIESEL WHEELS.—A shot-blasting machine and equipment, supplied by the Pangborn Corporation, Hagerstown, Md., was installed about two years ago at a large western railroad shop for cleaning mounted diesel wheels and axles, and demonstrated its reliability and economy in this service. Installed in a prefabricated sheet metal shed about 40 ft long by 20 ft wide with double curtained doors, the equipment includes a cleaning unit, dust-collecting system and fan platform. The design permits roll-through operation, the wheels going in at one side of the shop, being processed through the machine and then rolling out the other side. Approximately 8,000 pairs of wheels per year are cleaned in this machine at an estimated cost of $1.26 per pair as compared with $2.93 per pair by previous methods, the net saving being $1.67 per pair or $13,374 per year.

The machine revolves wheels at about 50 rpm under six automatic moving shot-blast nozzles with $\frac{3}{8}$-in. carbide tips which move slowly over the wheel and axle surfaces as the assembly revolves, quickly removing all rust, dirt and scale preliminary to Magnaflux inspection for any possible defects. Approximately 3 min is required in the machine for one pair of diesel wheels and 2 min for a single pair of car wheels. In case the wheels have exceptionally heavy coats of dirt and grease, the machine may have to be cycled more than once in order to remove all foreign material. When finished, the mechanically operated doors on either side of the machine are raised, the pair of wheels in the machine elevated and rolled to the outgoing track, the mechanism then dropping back to receive the next pair of wheels rolled in from the opposite side.

Both locomotive and passenger car wheels are cleaned by this method, the machine being operated by two men who clean an average of 120 pairs of wheels each 8-hr day. The former method of sand blasting took two men 8 hr to clean 16 pairs of wheels. Production was then stepped up from 16 to 120 pairs of wheels per 8-hr day.

A number of attendant advantages have been demonstrated by this new method in addition to the speed and effectiveness of the cleaning operation. By previous sand blasting methods, it was necessary to move wheels some distance to a sandblasting set outside the shop which involved additional labor and delay. The added production with the new equipment permits keeping modern car wheel lathes in full-time operation, thus removing a bottleneck and permitting the shop to supply the large number of locomotive and car wheels required for equipment repairs at this shop and outlying points.



Engineman's controls. On the control board at the right are, from top to bottom; alarm lights with provision for flame out and dynamic brake warnings, load meter and speedometer, booster air pressure, lube oil pressure and fuel oil pressure meters. Switches control lights and circuit breakers. The box on the side contains the wheel slip buzzer. Photograph taken from position directly behind operator's seat.

Alco Simplifies Its Locomotive Control

Only one rotating device is required to govern generator output and to provide all necessary electrical protection

The Alco simplified static excitation control which has been undergoing field testing and development for more than three years is now being applied to all road type locomotives built by Alco Products, Inc. The control which includes only one rotating device, limits maximum current and voltage values and insures the maintenance of constant horsepower for each throttle position, within the current and voltage limits, through the speed range of the locomotive.

The single rotating device is a three-phase a-c alternator, the speed of which is proportional to engine speed. All other devices are non-rotating or static such as resistors, capacitors, rectifiers and reactors. The electrical and mechanical protection needed is provided by the components of the control system.

The system supplies and controls generator field current. The alternator output, which is controlled and rectified, is used to excite the traction-generator field. When voltage, current, or horsepower tend to become excessive, components of the system limit, or control,

the alternator output. This reduces the generator field current to a value which will keep voltage, current or horsepower within safe limits.

Figure 1 shows a traction generator with accessories. The GTA-6 alternator is mounted on the traction generator between the auxiliary generator and the power take-off. The gear ratio between the alternator and the generator is 2.386 to 1. The alternator will be rotating at approximately 2,326 rpm when the engine is running at full speed of 1,000 rpm.

The output of the alternator is 3-phase a-c at 83.6 cycles and approximately 70 volts at idle speed. At full speed, the output is 238.6 cycles and approximately 200 volts.

The auxiliary generator is used primarily for battery charging and for furnishing 75 volts to the control system.

Figure 2 indicates the alternator *A*, the power reactors and the rectifiers. Also shown is the connection of the alternator field across wires *71* and *4*. This is a 75-volt source which is the regulated output of the auxiliary generator.

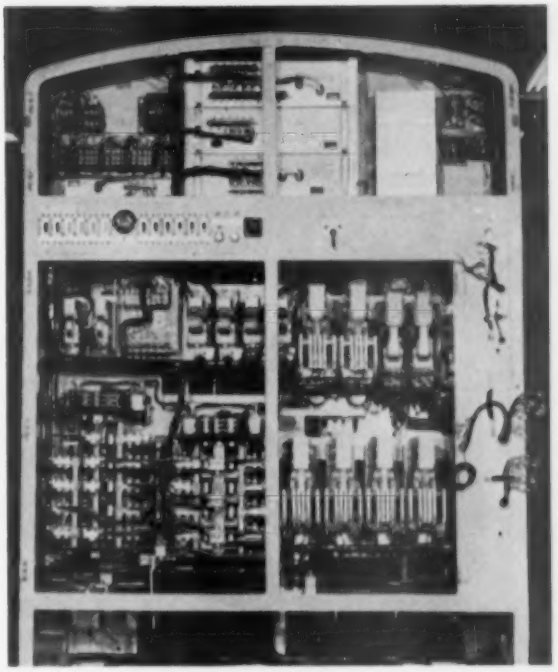
Figure 3 is the transformer shown as *ET* in Fig. 2, located in the back of the control compartment. It is connected to one phase of the alternator. The secondary windings, which are not shown, provide a voltage source for current supply to various elements of the excitation system.

One of the three power reactors to which the alternator output is fed, is shown in Fig. 4. Connections to the three reactors are shown in Fig. 2. The four corner terminals of the reactor are the power teminals which connect the reactor into the generator field circuit.

Figure 5 shows one of the laminations used to make up the core of a power reactor. Superimposed on these laminations are the a-c and d-c windings. The a-c windings are in parallel, but wrapped around the outer legs so that the flux of either core is opposite to that of the other core.

The d-c windings are shown as one winding wrapped around the inner legs of both cores. Seven windings are used in the control system operation. The d-c winding is wrapped around both cores in such a way that the d-c flux created by the d-c ampere turns will aid or oppose the a-c flux of both cores at the same time.

One of the three power rectifiers is shown in Fig. 6.



Cab side of the main control compartment.

These are connected between the power reactors and the generator field. Their function is to change the 3-phase alternating current to direct current. This current is then fed directly to the generator field.

The three power reactors and the three power rectifiers connected between the alternator and the generator field are shown in Fig. 2. Contactor *GF* is connected between the rectifiers and the generator field for disconnecting purposes. This connection diagram shows the basic elements which furnish current to the traction generator field.

The alternator field is fed by the regulated auxiliary generator voltage. Rotation of the alternator creates a three-phase alternating current voltage output. The output of the alternator is fed to the power reactors through

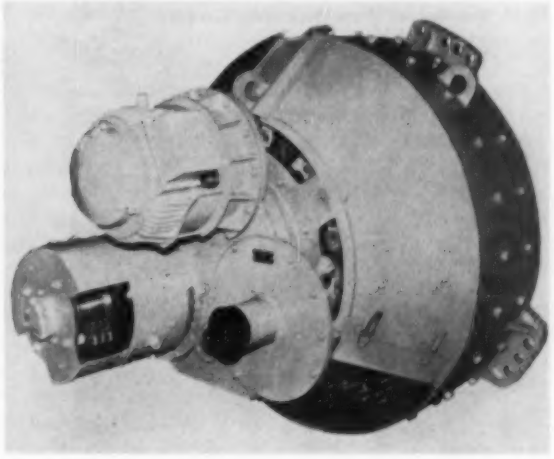


Fig. 1. The main generator (left) with the three-phase alternator above, and the 75-volt d-c auxiliary generator below at the left.

Fig. 2. Simplified wiring diagram (below) showing the alternator, power reactors, rectifiers and traction generator field.

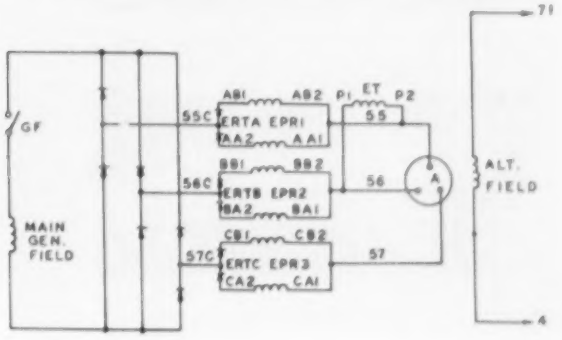
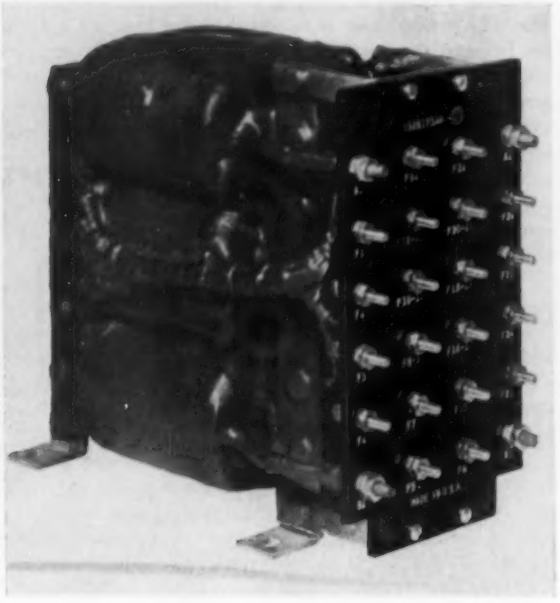


Fig. 3. The transformer (ET) (left) is a three-phase unit.

Fig. 4. Power Reactor (ERP) (below) in which a-c current is controlled by d-c current.



wires 55, 56 and 57, Fig. 2. The transformer (*ET*) is connected to one phase of the alternator output between wires 55 and 56.

Current to Rectifiers

The output of the alternator after going through the reactors, where the amount of current has been set by the d-c control windings, now goes to the rectifiers.

Here the three-phase output of the alternator is rectified to direct current. The direct current is then fed to the generator field. The generator field is connected to or disconnected from the circuit by the *GF* contactor.

The power reactors are controlled, through the control windings, to vary the generator field current and impose the three limits, mentioned earlier, on the system.

The limit panel, Fig. 7, imposes the limits on the system through three control windings on the power reactors. The panel contains all the electrical equipment necessary to impose these limits. Outgoing connections

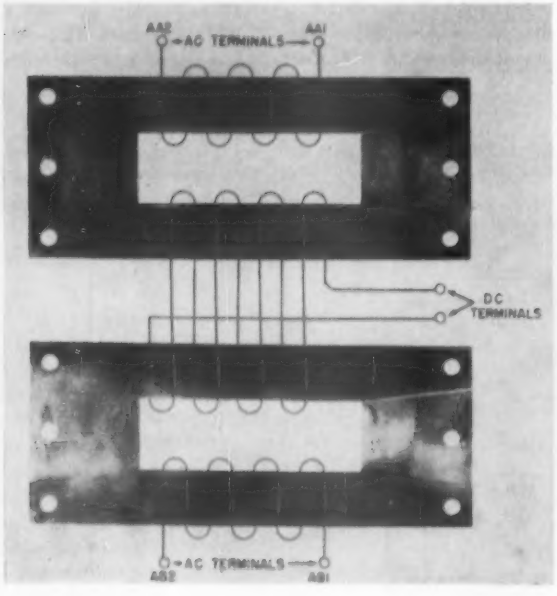
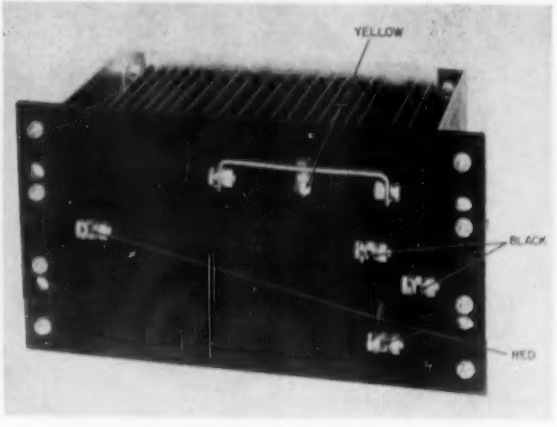


Fig. 5. A power reactor (left) core lamination with indications of a-c and d-c windings.

Fig. 6. One (below) of the three power rectifiers.



from the panel to other parts of the circuit and to the three reactor windings are made from the terminal boards on the front of the panel. A rheostat to vary the voltage limit is behind the movable nameplate on the front of the panel.

A complete block diagram of the control system is shown in Fig. 8. Figure 9 is the armature current control reactor, shown as *ACCR* in Fig. 8. It is connected, much like a shunt, in the generator output circuit and measures generator amperes. It feeds a signal to the limit panel. The voltage source for this reactor is transformer secondary winding *S1-S2*.

A voltage control reactor, *VCR* in Fig. 8, is connected so that it measures generator voltage. It also feeds a signal to the limit panel. The voltage source for this reactor is the transformer secondary winding.

The armature current control reactor (ACCR, Fig. 8), is in the circuit between the traction generator and the traction motors. It measures generator armature current and sends a signal to the limit panel. The voltage control reactor (VCR) measures generator voltage. It also sends a signal to the limit panel. The line between the transformer and the limit panel represents connection of two transformer secondary windings to the limit panel. The diagram also shows the d-c control signals which have been mixed in the limit panel being sent to the power reactors.

The reference panel, Figs. 8 and 10, receives three signals from the alternator through three transformer secondaries. These three signals are so mixed and amplified that the reference voltage which is produced is proportional to engine speed. The reference panel voltage output is proportional to alternator frequency only, which is a measure of engine speed, and not to alternator volts. The voltage is approximately 27 volts at idle speed and 93 volts at full speed. No adjustments are made to the reference panel except on the test bench. The line between the transformer and the reference panel represents the connection of the three transformer secondaries to the reference panel.

The line between the reference panel and the limit panel represents a signal fed to the limit panel by the reference panel.

Speed Regulation

The engine control panel is shown in Figs. 8 and 11. It contains electrical equipment which functions in conjunction with the governor to set and regulate engine speed. The three rheostats, *SAR1*, *SAR2* and *SAR3*, set the proper idle and running speeds and check the overspeed trip rpm.

As previously stated, the reference panel output is proportional to engine speed. The dash line between the reference panel and the engine control panel and then onto the governor represents a speed signal being sent to these two devices.

With an increase in engine speed the reference signal to the limit panel, the engine control panel and the governor increases. Now the *ACCR* and *VCR* signals to the limit panel can also increase. New and higher values of current and voltage can be produced by the generator before *ACCR* and *VCR* signals, through the limit panel, impose new limits on the generator output.

Figure 12 shows the limit range panel. It contains

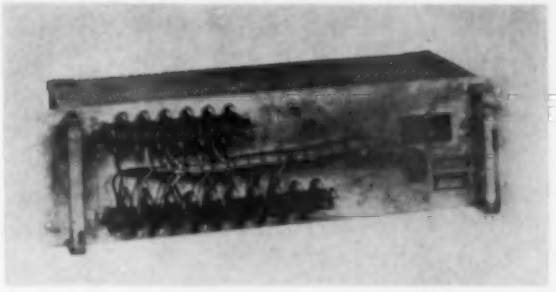


Fig. 7. Limit panel which imposes limits on the system through three control windings on the power reactors.

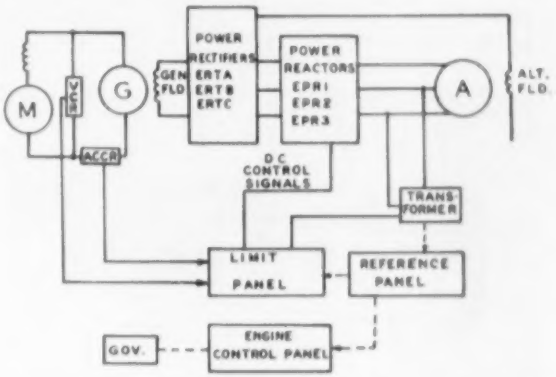


Fig. 8. Complete schematic control wiring diagram including the engine control panel and governor.

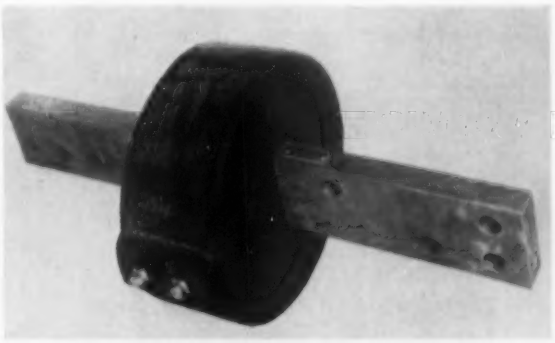


Fig. 9. Armature current control reactor (ACCR).

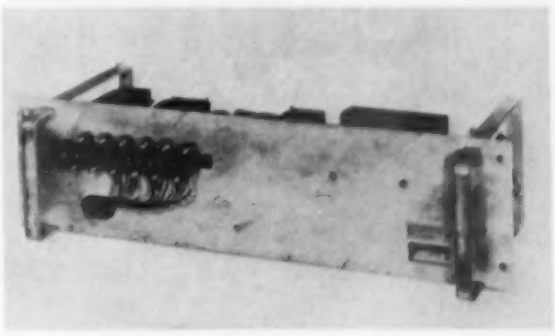


Fig. 10. The reference panel. Its output voltage is proportional to alternator frequency and to engine speed.

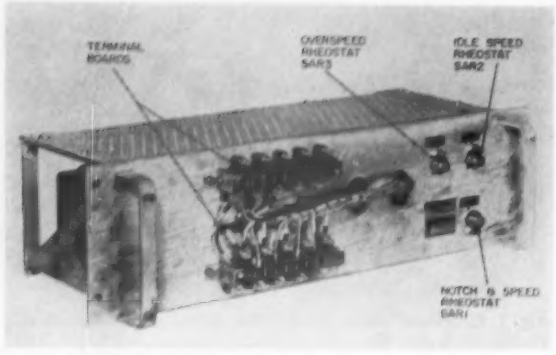


Fig. 11. The engine control panel which controls engine speed.

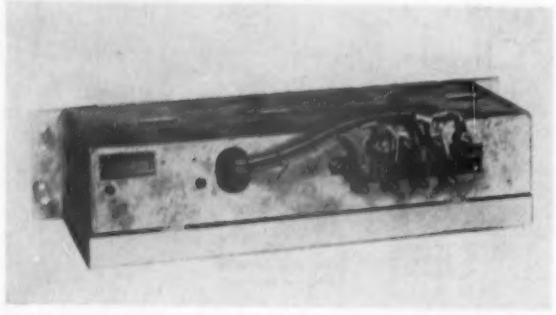


Fig. 12. The limit range panel which adapts to control to locomotives of different horsepower.

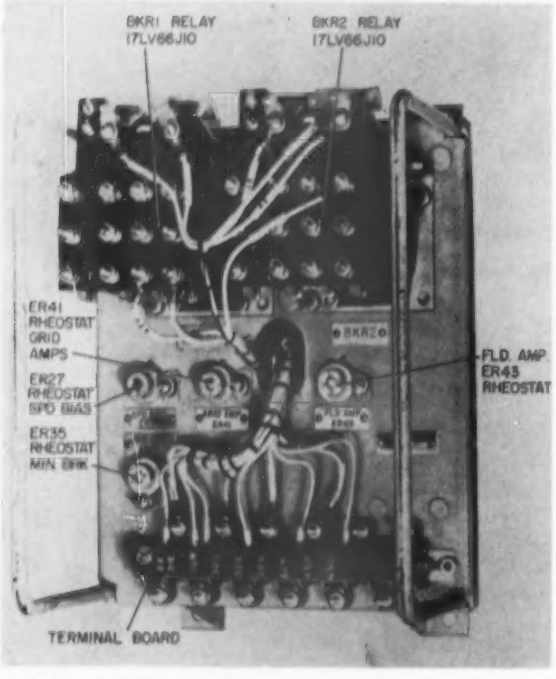


Fig. 13. Front view of the dynamic braking panel.

resistors and rheostats which adapt the static control system to locomotives of varying horsepower. By making changes in the limit range panel only, all other excitation panels can be moved without change, for example, from an 1,800-hp locomotive to a 2,400-hp locomotive. Rheostats are set on the bench according to the type number of the panel. No further adjustment is necessary on the locomotive. The dynamic braking panel is shown in Fig. 13. This panel is used on locomotives equipped with dynamic braking. It contains a germanium rectifier, a capacitor, seven resistors and two *17LV66* relays.

Rheostat *ER27* is the only rheostat set on the test bench. All other rheostats are set with the panel on the locomotive. The setting for *ER27* is determined by the horsepower of the locomotive, its gearing, and the type of traction generator and traction motors used.

The Governor and Its Operation

The governor used on Alco locomotives with static excitation is the GE-type, 17 MG8. This governor is the same in principle as the MG6 governor that is used on Alco locomotives with amplidyne excitation. The feature providing a definite fuel limit cam position for each throttle notch has been eliminated from the MG8 governor. This has been made possible because with static excitation, the electrical system imposes a horsepower limit as a function of engine speed.

The major difference between an MG6 and the MG8 governor is that the fuel limit pilot valve, the fuel limit rheostat and brush arm have been eliminated from the MG8. The speed pilot valve of the MG8 controls both the speed slave piston and the fuel limit slave piston in the MG8. An orifice restriction and ball-check valve have been added to the pressure oil line to the fuel limit slave piston. This orifice and ball check provide the delay in fuel advance rate with a lesser delay for fuel decrease.

Briefly the operation of the MG8 governor is as follows: As explained previously the reference panel sends the signal to the governor. This signal is an electrical voltage which is proportional to engine speed. When the engine speed is such that this signal can maintain 475 m.a. with the throttle set in a given position and a given condition of engine loading, the pilot valve is balanced. The pilot valve can be thrown off balance by either of two things—a change in throttle setting which changes the resistance of the pilot valve circuit, or a change in loading causing momentary changes in engine speed which causes a change in the signal from the reference panel. Assume that the governor is in the balanced condition. The throttle is advanced to call for an increase in engine speed. The added resistance in the pilot valve circuit reduces the current in the pilot valve below that required for balance. This causes pressure oil to flow to both slave pistons in the direction which causes the governor output shaft to position the racks for more fuel. With the added fuel, the engine is able to accelerate, thereby increasing the signal from the reference panel to a point where the pilot valve current is restored to the balance value at the new setting of the throttle. This same action would take place if the pilot valve were thrown off balance by an increase in load causing the engine to slow down momentarily. The opposite effect is produced by a decrease in load or a reduced throttle setting.

More About D-C Hi-Potting

Series of tests show that d-c voltage current leakage curves can tell much about the effectiveness of maintenance methods.

Equipment for d-c high-potential testing and proposed methods of testing procedure were described in the February 1956 issue of *Railway Locomotives and Cars*. Results of tests showing how the method may be used to benefit traction motor overhaul and repair are described in the following paragraphs.

To overcome the serious limitations of the a-c overpotential test, it is proposed to substitute d-c voltage tests which are more informative and permit a quantitative analysis of the condition of the insulation. D-c testing has been widely used and accepted for maintenance testing of large high voltage generating equipment over the past several years, and the tests described here were made to determine the practicability of the method as applied to traction motor armatures.

Correcting Leaking

The test procedure employed consisted of applying a relatively low d-c voltage to the armature windings and recording the leakage current after it had stabilized, then continuing this procedure at progressively higher voltages in steps of 500 volts until a predetermined voltage level had been reached. The leakage current at each voltage level was reduced and plotted on a curve and the trend carefully observed. If a decided upward trend was noted, the test was stopped, and attempts were made to correct this condition by cleaning and dryout processes. After each process the windings were retested in the same manner to check if any substantial improvement was indicated. If there was no appreciable improvement, other more thorough cleaning and dryout methods would be tried, and the windings rechecked using the same step by step d-c test procedure. The results of these tests were very enlightening and revealed some possible shortcomings in presently accepted cleaning methods. In all cases, the reconditioned armature windings were rechecked after assembly of the machine using the d-c step by step test and an equivalent one minute a-c overpotential test. As would be expected, no failures occurred during the a-c overpotential tests.

Analysis of Test Results

The results of typical test data are shown in Figs. 1 to 8. It will be noted from Fig. 1 that a new traction motor winding as tested at the factory has a high level of insulation integrity and is free of moisture and surface dirt. This curve therefore is typical of the ultimate that could be expected. As indicated by the curve, the increase in leakage current with increased voltage is very slight and a straight, almost flat line is obtained. It should be obvious that the sole purpose for presenting this curve is to

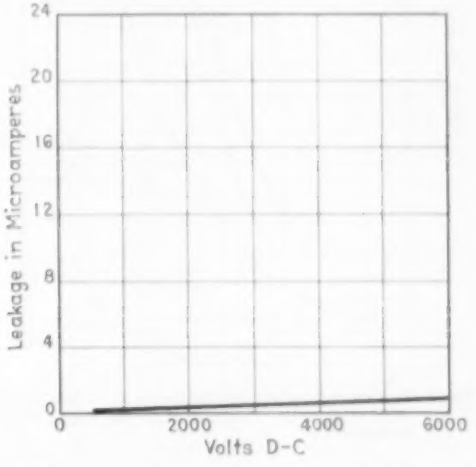


Fig. 1—D-c voltage-current leakage curve of a new traction motor armature.

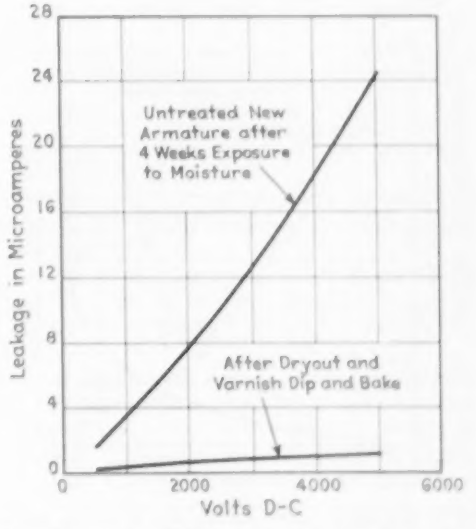


Fig. 2—D-c voltage-current leakage curve of a new traction motor armature after four weeks exposure to moisture.

Excerpts from a paper presented by William Schneider and P. G. Lessman, both of Westinghouse Electric Corporation, before the Winter General Meeting of the American Institute of Electrical Engineers, January 30—February 3, 1956, in New York.

establish a base for comparison and analysis of other data.

The effect of surface moisture and moisture penetration on a new winding as recorded by the d-c leakage current test, is shown in Fig. 2. This particular armature was not given any varnish treatment after completion of the winding, and was left in an area of high humidity for four weeks prior to the test. It will be observed that a steady increase in leakage current with each increase in d-c voltage was recorded. This type of curve is indicative of moisture only, since surface dirt was excluded from this test. A normal oven dryout prior to varnish treatment followed by the usual varnish dip and bake, restored the winding to the original as new condition.

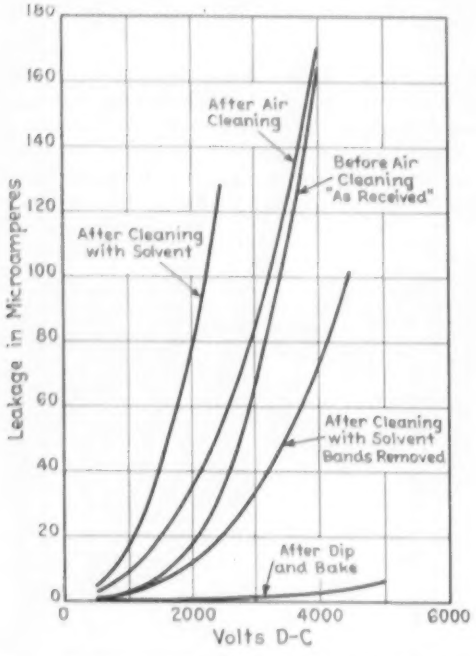


Fig. 3—D-c voltage-current leakage curves of traction motor armature after three years of service, at several stages of maintenance processing.

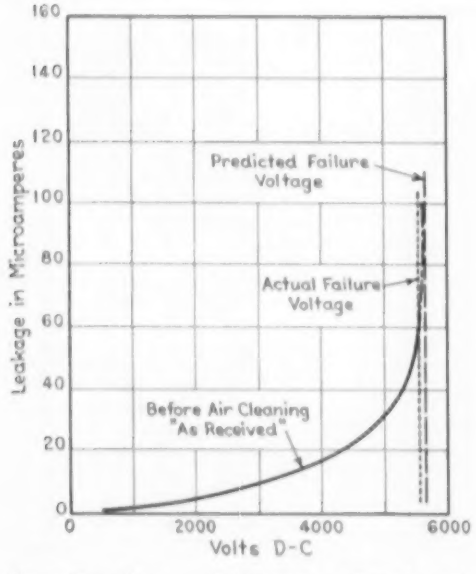


Fig. 4—D-c voltage-current leakage curve of traction motor armature returned from service and tested to breakdown. Predicted failure at 5,800 volts. Actual failure 5,600 volts.

The following five curves, Figs. 3 to 7, give some typical data taken on d-c traction motor armatures, which had been in service a number of years. All of these armatures were carefully inspected for defects and general winding condition before application of test voltage. No serious winding defects were observed, but all of the windings were extremely dirty.

Figure 3 illustrates very clearly the importance of thorough cleaning methods to an effective maintenance program. It will be noted that the as-received condition of the winding was indicative of moisture or dirt, since a steady increase in leakage current with each increase in voltage was observed. At 4,200 volts, a current runaway condition was noted. At this point, the leakage current continued to increase rapidly without an increase in voltage. It is safe to conclude, from this curve, that a high rate of leakage over the dirt covered creepage surfaces was very likely responsible for this behavior. This phenomenon of current runaway is quite likely to occur on armatures which have had prolonged service without cleaning, or improper cleaning of the winding. In order to restore the winding to normal, it was decided to embark on a cleaning program.

As is evident from the curve, cleaning of the armature with high pressure air had very little effect on the d-c voltage-leakage current characteristics. Contrary to our expectations, the leakage current had increased slightly and the current runaway still existed. Following the removal of dirt with high pressure air, the armature was subjected to a normal solvent cleaning procedure of washing and spraying with air-solvent mixture. The disappointing effect of this generally accepted cleaning method is clearly indicated by the curve, which obviously is improvement in reverse. Current runaway occurred at an even lower voltage.

It was decided, at this time, to do a more thorough cleaning job. The bands were removed and the entire armature was immersed in a solvent bath in which the solvent was continually agitated. The effectiveness of this cleaning method is evidenced by the improvement in the d-c leakage-voltage curve. Further improvement in insulation condition was achieved by additional dryout and varnish treatment.

This set of curves is particularly significant because it illustrates the informative nature of the d-c overpotential test and its usefulness in determining the condition of the insulation without any destructive effects. It is highly probable, and almost a certainty that this winding would have failed had it been subjected to an a-c overpotential proof test after normal cleaning and varnish treatment. The d-c overpotential tests, on the other hand, not only described the condition of the insulation after each operation, but they also pinpointed the source of the trends indicated by the series of curves. It is this type of data which we expect will be most valuable and useful to maintenance personnel in establishing sound maintenance procedures and in the evaluation of insulation condition.

Another approach to the problem of determining the

adequacy of the insulation is shown in Fig. 4. Although we do not recommend this method of testing insulation to determine its predicted breakdown strength, we nevertheless consider it as useful information which may be of assistance in analyzing the winding's chances for future service.

The armature winding was tested in the as-received condition. The voltage was raised in steps of 500 volts and leakage current recorded. The data was plotted immediately in order to observe any radical changes in trend. At 5,500 volts, the curve was extended in an attempt to predict the failure voltage. As can be seen from the curve, the prediction was reasonably accurate. The extrapolated curve and the tangent to the curve, or the asymtote, gave a predicted d-c puncture of 5,800 volts, whereas failure occurred at 5,600 volts. In normal maintenance practice, this breakdown voltage would never have been reached since our recommended test voltage is considerably lower.

Figures 5, 6 and 7 are typical examples of the average data taken. It is interesting to note that proper cleaning methods and varnish treatments resulted in progressive improvements in the windings.

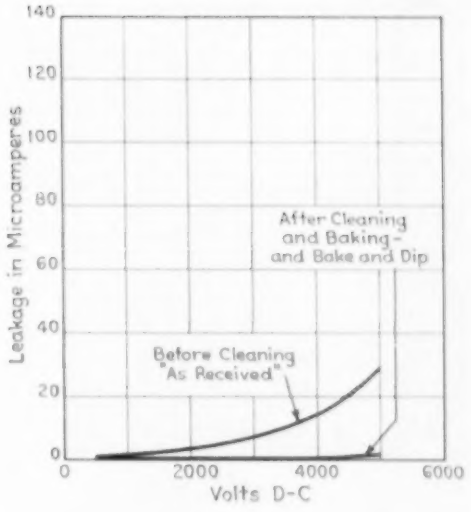


Fig. 5—Typical voltage-current leakage curve of traction motor armature before and after reconditioning.

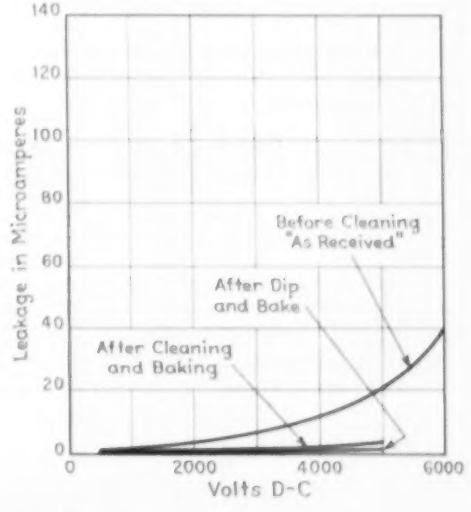


Fig. 6—Typical voltage-current leakage curve of traction motor armature before and after reconditioning.

Conclusions and Recommendations

The data presented in this paper provide basic information regarding the usefulness and value of d-c overpotential tests. It is hoped that this data will serve as a foundation for future maintenance tests, and that it will stimulate interest on the part of operators and maintenance people in d-c testing. The non-destructive nature of the d-c tests not only makes it possible to evaluate the insulation condition, but also to check the effectiveness of the cleaning and maintenance procedure. This feature of checking the progressive winding conditions after each phase of the maintenance process we consider to be of utmost value and importance. It provides the maintenance personnel a constant check on their processes and gives them an opportunity to take corrective action where indicated. Figure 8 shows an example of an armature winding which was improperly handled.

Although the voltage-current leakage curve indicated further cleaning was necessary, the armature was varnish-treated with the result shown. Good maintenance practice would have dictated further thorough cleaning methods before proceeding to the next phase of varnish treatment. It is quite evident that presently accepted tests would never have detected the improper handling of the winding, whereas the d-c overpotential test clearly describes the condition after each phase of the maintenance procedure. One cannot help but wonder how many windings have been returned to service in similar or worse condition.

The d-c overpotential test method as outlined in this paper will fulfill the seven primary objectives of maintenance testing as follows:

1. To demonstrate the adequacy of the insulation.
2. To evaluate the condition of the insulation and creepage surfaces.
3. To determine the corrective action required to restore winding to safe operating condition.
4. To predict, if possible, the probable useful life of the winding.
5. To establish a sound periodic maintenance inspection program to minimize service failures and attain greatest usefulness of machines.
6. To use the experience and data thus obtained as a guide for improving present maintenance techniques and cleaning methods.
7. To provide useful data for analytical evaluation of service experience and performance thus directing attention to possible improvements in design and manufacturing methods.

To demonstrate the adequacy of the insulation, it is necessary to establish maximum test values for each voltage class. These values should be high enough to detect pinholes through the insulation and any other major insulation damage. At the same time, the voltage should not exceed what is considered a reasonable value with ample margin of safety. The object of these tests is not to destroy the insulation but to analyze its con-

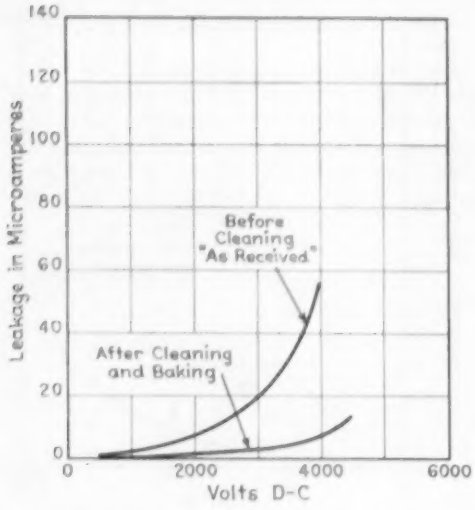


Fig. 7—Typical voltage-current leakage curve of traction motor armature before and after reconditioning.

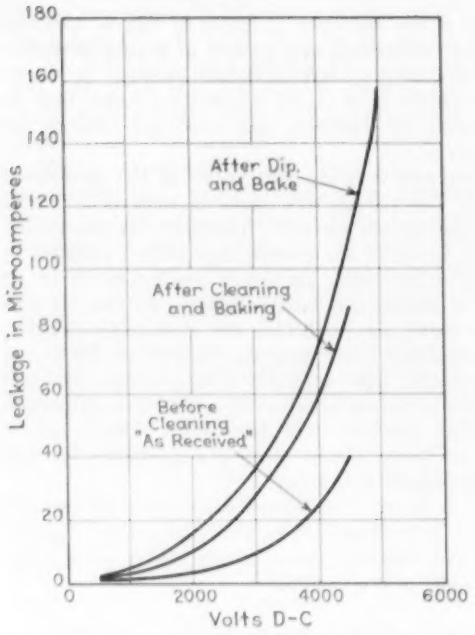


Fig. 8—D-c voltage-current leakage curves of traction motor armature improperly reconditioned.

ditions and determine its adequacy for reliable future service.

Based on the experience gained on large machines, the following test values for traction motors and generators are recommended:

Rated voltage class	New machine one-minute final a-c test	Proposed d-c maintenance test voltage
0-100	1,200	1,400
101-250	2,000	2,300
251-500	2,500	3,000
501-750	3,000	3,500
751-1,000	3,500	4,100
1,001-1,500	4,500	5,300
1,501-2,000	5,500	6,500
2,001-2,500	6,500	7,600
2,501-3,000	7,500	8,800

All a-c voltages are rms values. The above values were derived by using 2/3 of the new machine test voltage for maintenance testing and using a conversion factor of 1.75 as the ratio of d-c to a-c (rms).

The technique of d-c maintenance testing as outlined should be to apply a low voltage (less than 25 per cent of the final value) and to increase the voltage in several steps until the final maximum value is reached. Close observation of leakage current versus voltage, plotted in curve form will reveal much valuable information about adequacy of the insulation; condition of the insulation; corrective measures required and their effectiveness.

Accumulation of such data and service experience over a period of years will be of further value in analyzing the results to reach further conclusions as to predicted service life; improvements in maintenance procedure; and improvements in design.

Railroad with Longest Electrification Celebrates

Swedish railroads are now celebrating their centennial. Of the total of 10,300 miles of route, 93 per cent of the railways are publicly owned and operated, constituting the largest business enterprise in Scandinavia.

Aside from the predominantly public ownership and management, probably the most significant feature of the Swedish railroads is their extensive electrification which now includes 4,200 route miles. The longest continuous electrified line runs from Trelleborg, in southernmost Sweden, to Narvik, in northwestern Norway, not far from the Swedish border, a distance of approximately 1,370 miles. The 40 per cent of the Swedish railways now electrified carry about 87 per cent of the traffic.

About 34 per cent of the income of the State Railways is derived from passenger traffic, 63 per cent from freight traffic, and three per cent from other sources.

Most of the rolling stock of the State Railways is manufactured in Sweden but a considerable number of diesel locomotives, the majority of which were built in West Germany, have been put into service in recent years. Special insulated cars and refrigerated freight cars are also being added in increasing numbers.

Railbuses have been in general use for about fifteen years. A new fleet of 850 units has been ordered from various Swedish manufacturers. The newest type of railbuses weighs 17.4 tons, as compared with 40 tons for a railway passenger car, and will accommodate up to 90 passengers, of whom 53 can be seated. Trains made up of as many as 10 railbuses are operated by a multiple-unit system of pneumatic-electric devices. Beside the diesel-operated cars, 30 railbuses made for electric propulsion are now in operation.

Fig. 1—Battery care starts with proper voltage regulation of the charging generator on diesel locomotives on the Union RR. R. E. Funk, chief electrical foreman, checks voltage regulator in cab of diesel locomotive.

Fig. 2—Diesel starting batteries are given equalizing charge and inspection frequently to obtain maximum life and insure dependable service on the road.

Union RR Shop Prolongs Battery Life

With 140 diesel units in service, the Union RR, Pittsburgh, Pa., has a large investment in batteries for engine starting and auxiliary power supply. Realizing that an increase in battery life means a decrease in capital expenditures for new batteries, the Union has set up a battery maintenance system which includes new shop facilities.

Careful attention is given to adjustment of the voltage regulator on the locomotives. If the voltage regulator is set too high, the battery will be overcharged and overheated, resulting in battery failure. Setting the regulator too low means that the battery will not be charged sufficiently to start the diesel engine. Before a locomotive is returned to service after a visit to the shop, the voltage regulator is checked for proper adjustment.

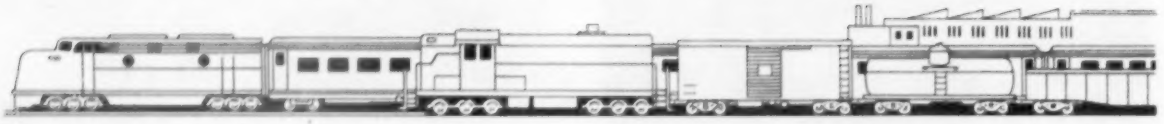
When locomotives are brought into the shop for overhaul, the batteries are taken to the battery shop for washing, inspection and an equalizing charge. Specific gravity and voltage of the individual cells is recorded to detect defective cells. Adjustment of the specific gravity and additional charging has been found effective in restoring batteries.

Charged batteries are on hand at all times in the battery shop, to replace those withdrawn from service for checking. A portable hydraulic hoist is used to move batteries in the shop.

Adding water to batteries to keep the electrolyte level up to the proper mark is made easy. A portable tank adapted from an aluminum beer keg holding 15 gallons of distilled water is mounted on a short pedestal. The locomotive repair pits are depressed so that simple gravity flow is used for most models of locomotives. When gravity flow is not sufficient low pressure air is connected to the tank to force water into the batteries.

Fig. 3—A portable hydraulic hoist permits easy battery handling.

Problem Page . . .



. . . WHERE THE TOUGH ONES ARE HANDLED

A new question this month. Remember that it pays you to share your ideas and experiences with our readers. Submit letters to the Problem Page Editor.

Now that the controlled-clearance journal bearings are mandatory on freight cars, do they complicate repair track operations? What proportion of the total used are the A-1 size? The A-3 size? The A-5 size? Has it been your practice to reclaim journal bearings, and can it be done now?

Hard-Riding Passenger Cars

When a passenger car is reported as a "hard rider," what is checked, and in what order is this work done? What are the most frequent causes of poor riding?

(*Discussion continued from March issue*)

MAJOR TROUBLE SPOTS, *by J. H. Sinnar, terminal master mechanic, Union Pacific, Los Angeles.* When a hard-riding passenger-car truck is reported, truck conditions are first checked by an inspector and any obvious defects corrected. If no bad conditions are apparent, the truck is looked over by a supervisor and rechecked to discover what is causing trouble.

The most frequent causes of hard riding passenger-car trucks, and the things looked for first are tread-worn wheels, pedestal liner wear and looseness in bolster anchor-bar connections. Next checked is side-bearing clearance which must be maintained within definite limits. Bolster hanger pins and bushings can be worn so as to interfere with free bolster swing motion. Worn equalizers interfere with box movement and tend to make the truck rigid.

Springs may be broken, or they may have insufficient travel due to permanent set. Snubbers become ineffective when there are oil leaks or worn friction bars depending upon the type. Trucks do not swivel freely when center plates are dry. The truck can be forced out of square when pedestal wear plate thickness has been improperly calculated.

SOLUTION—REGULAR MAINTENANCE, *by an eastern railroad.* Today's passenger cars are carefully designed for satisfactory riding. Bolsters, equalizers and springs are selected and located to handle the car's weight. The trend has been toward coil springs with snubbers to restrict excessive spring action. Trucks are fully equalized to distribute weight, wheels are turned to almost perfect roundness, and much attention has been given to center bearing castings principally by increasing the bearing surface.

When rough riding reports are received, one must first obtain as much information as possible as to the action of the car. Reports should indicate vertical motion, lateral motion, or lurching action. If correct information can be obtained, it is much simpler to locate the cause. Without adequate reports, it takes extensive examination which includes checking center castings, side bearing clearance, wheel conditions, and spring heights both free and loaded. Truck heights give indications of spring conditions. Trucks must be level and at the proper height. If not, they must be adjusted by renewing springs, applying shims, or making other repairs. After trucks are level it may be necessary to make bolster adjustments to level the car body because this is very important. The car body should be level so that all weight is carried on the center bearings and no weight is carried on side bearings. The purpose of side bearings is balancing on curves and uneven track. The weight of the car body should never be on both side bearings of a truck at the same time. This would restrict the movement on the center plate interfering with proper truck action when rounding curves.

To keep passenger cars riding satisfactorily, it is necessary to program maintenance at such frequent periods that necessary corrective repairs can be made. The periodic attention depends entirely upon the service to which the equipment is assigned and the mileage it makes with consideration for the type railroad over which the equipment operates. If cars operate in an assignment which makes 500 miles per day, or 15,000 miles per month, it would be necessary to put them over shop tracks at least once each six months. At this time all necessary work should be done. Wheels can be changed, swing hangers should be checked to see that they are working freely, trucks checked for proper heights, springs inspected, and centers greased. Trucks should be completely overhauled every two years. With such attention passenger cars should ride satisfactorily at all times.

IS IT TRUCK TROUBLE?, *by J. Robinson, general car foreman, King Street Station, Seattle.* Maximum riding value in trucks, particularly those of the four-wheel type, cushioned totally by helical springs will not be achieved if frames and holsters are not maintained at approximately perfect plane. Because of the close tolerance between journal boxes and pedestals, the slightest slant in truck frame position will cause the journal box to seize in the pedestal and thereby arrest spring resillience which is vital. A tipped truck bolster likewise permits the car body to list. This impairs the equilibrium at the center bearing affecting riding qualities and quietness. Adequate clearance between upper and lower side bearings is essential on cars equipped with center plates not of the late type with increased diameter. Impaired clearance on cars with side bearings will cause the truck bolster to tip in unison with car body when rounding curves. This imposes bend-

(*Continued on page 78*)

Here's why FREIGHT CARS NEED SOLID JOURNAL BEARINGS

It's not just a question of low initial cost: you also choose solid-type bearings because they offer the utmost in load capacity, protection for lading, ease and simplicity of maintenance and many other advantages. They all add up to a BIGGER NET RETURN per car dollar invested.

SURE, you get up to 10% more cars for your money, up to 10% more car availability, and hence more freight revenue per car dollar invested with low-cost solid bearings. But there are many other inherent advantages, too. Let's take a quick look.

1. Unrestricted as to Speed and Load

Steel, stone, ore—you can take the biggest loads with solid bearing cars—right up to axle capacity. Solid bearings reduce these maximum loads to about 700 psi—well within bearing and oil film capacity. (Compressive strength of the babbitt at highest normal temperatures is over 7200 psi.)

What about speed? Oil film pressures increase with speed. You get a thicker film of oil that more than compensates for any viscosity change. *With solid bearing cars you're actually better off in the higher range of freight train speeds.*

2. Ease and Simplicity of Maintenance

The AAR journal bearing assembly is a simple standard. Internal parts can be easily inspected or removed—without special tools or equipment, with the minimum of effort and time.

There's no need for expensive shop facilities or skilled labor. Stocking of parts is simple and replacements are available at any repair point of any line. And unlike other bearing types, in the event of road failure you can almost always make necessary repairs and bring a solid bearing car in on the same wheels.

3. Greater Protection for Lading

With solid bearings lading gets the smoothest possible ride on standard freight car trucks. That's because lateral shocks are flexibly controlled—not rigidly opposed. This means less wear and tear on car bodies, trucks, wheel flanges and rails, too!

4. Weight and Resistance Advantages

In motion the solid bearing glides on a film of oil like a skater on ice. Dynamic resistance is as low or lower than that of any other type of bearing—averages less than one pound per ton regardless of the outside temperature or speed of operation.

Solid bearings also save many tons unsprung dead weight on every moving train. Lighter weight, plus lowest possible resistance in pounds per ton, puts the maximum tractive effort of the locomotive to the business of moving goods.

5. Improved Dependability in Freight Service

Solid bearing performance is getting better all the time. In 1954, there was only one set-off for every 15 cars—equivalent to each car operating 15 years per road failure of a bearing. And this average car was almost 20 years old. You can bet that other bearing types would have a tough time trying to beat that record.

Better still, means are now available to reduce journal box servicing requirements and get still better solid bearing performance. Improved bearings and lubricators are now being installed. Periodic servicing—on a calendar basis—and 3-year repacks will not be far behind.

You save money in many ways with solid bearing cars, and you will save even more in the future. With so many inherent advantages, you just can't beat solid-type bearings for railroad rolling stock!

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6-SL Brake Equipment

This is a new series of Questions and Answers pertaining to the 6-SL air brake equipment for switching locomotives. The references to the pamphlet, page and part numbers in the text indicates where the original material may be found in the manufacturer's technical publications and instruction pamphlets. Authorized persons may obtain a copy of Instruction Pamphlet Number 5046-15 which deals with this equipment by applying to the nearest district office of the Westinghouse Air Brake Company.

Brake Cylinders

W92-Q—What type of brake cylinders are used with the No. 6-SL equipment?
A—The improved "UAH" brake cylinder.

W93-Q—What is the arrangement of the cylinder body on the type "UAH"?
A—As shown in a sectional view on Fig. 20, the cylinder body and pressure head are combined into a single casting which is provided with a bolting flange for mounting, and a WABCOTITE mounting for pipe connections.

W94-Q—Describe the piston rod and its connections.
A—Piston (4) has a hollow rod which provides for a loose push rod (10), attached to the levers and rods of the brake rigging. A push rod holder is attached to the outer end of the piston rod.

W95-Q—Describe the piston assembly.

(Pamphlet 5046-15, page 28)

A—A solid WABCO packing cup snaps onto the pressure face of the piston. The circumference of the piston is machined to form a shoulder, over which the packing cup is fitted. A groove behind this shoulder contains a piston lubricator. The space back of the heel of the cup and in the front of the lubricator provides a groove around the piston for lubrication.

W96-Q—What is done to prevent entrance of dirt into the brake cylinder?
A—To prevent entry of dirt, the hollow piston rod is ground true in diameter and surface. The non-pressure head is fitted with a hollow rod lubricator packing seal *63*, held in place by spring seat *64*. Seal *63* is packed in grease and serves to lubricate the hollow rod, as well as seal the interior of brake cylinder against dirt and moisture.

W97-Q—What additional arrangement is incorporated in the non-pressure head to prevent entry of dirt?
A—Since atmospheric air must enter the non-pressure end of the cylinder during the release movement, the non-pressure head is fitted with a curled hair strainer *14*. This strainer is the cartridge type and is held in place by strainer retaining ring *15*.

Emergency Brake Valve

W98-Q—What is the function of the emergency brake valve (Fig. 21)?
A—To provide a means of venting the brake pipe and obtaining an emergency brake application from a source other than the automatic brake valve.

W99-Q—What does the emergency brake valve consist of?
A—Body *2*, in which are housed vent valve *3*, vent valve spring *8*, and valve nut *6*. Valve lever *10* is attached to the body by rivet *11*, and operating lever *9* by a similar rivet.

W100-Q—Describe the operation of the emergency brake valve.
A—Normally, when the brake pipe is charged, brake pipe air prevented from being vented by the seated vent valve. When operating lever *9* is pulled, valve lever *10* is moved downward, unseating the vent valve, venting brake pipe to atmosphere. When the operating lever is released, spring *8* seats the vent valve preventing further loss of brake pipe air.

Centrifugal Dirt Collector

(Inst. 5046-15, Page 29)

W101-Q—What type of dirt collector is used with the 6-SL brake equipment?
A—The well-known centrifugal dirt collector with detachable chamber and umbrella check valve. This type has a cut out cock incorporated in the body.

Air Filter

W102-Q—What type of air filter is used and where is it located?
A—Type H (*Fig. 23*) air filter is used and it is located in the main reservoir pipe leaving the last main reservoir.

W103-Q—Of what does the filter consist?
A—This filter consists of a cover, dirt chamber and baffle portion from which the filter unit is supported. The cover is fitted with unions and two tapped lugs for supporting brackets.

W104-Q—In what position is the filter placed on installation?
A—A raised arrow on the top indicates the direction of air flow.

W105-Q—How is the filter dirt chamber drained?
A—Pipe taps in the dirt chamber provide for a drain cock in either the side or bottom, and the tap not used is plugged.

(Inst. 5046-15, Page 30)

W106-Q—Describe the filter unit?
A—The filter unit is made of wire screen covered by felt which is pleated around and supported on a central perforated metal tube. Felt sealing pads are applied at top and bottom. This deep-seated method of folding the felt concentrates within a small space a large filtering area—several times greater than the inlet or outlet.

W107-Q—Describe the flow of air through the filter.
A—Air entering the annular intake is diffused downward between the baffle and dirt chamber, and passes through the filter unit and out the central opening at the top.

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Questions and Answers

24-RL Brake Equipment

This is a new series of Questions and Answers pertaining to recent developments in the 24RL air brake equipment for road locomotives. The first questions will deal with the Pressure Maintaining feature. Authorized persons may obtain information on this subject in Instruction Pamphlets 2606-1, and 2601-1 Supplement 1 by communicating with their nearest Westinghouse Air Brake representative.

Pressure Maintaining

R1-Q—What is purpose of pressure maintaining feature?
A—To automatically maintain brake pipe pressure equal to that of equalizing reservoir when automatic brake valve handle is placed in service lap position.

R2-Q—Explain this operation further.
A—After a brake pipe reduction is made and the brake valve handle is placed in LAP position, the pressure maintaining feature operates to compensate for brake pipe leakage, thereby maintaining a constant brake pipe pressure.

R3-Q—In what way is this feature related to handling of trains?
A—This feature was developed to control, with the aid of dynamic brakes, the speed of freight trains descending grades.

R4-Q—Is the use of retaining valves required in conjunction with Pressure Maintaining?
A—Only on mineral trains, in which case SLOW DIRECT EXHAUST position of the retaining valve is used.

R5-Q—Can the pressure maintaining feature be used to advantage on level or rolling territory?
A—Yes. It is also advantageous for slow-downs or stops in such territory.

R6-Q—Where is this feature incorporated?
A—In the automatic brake valve.

R7-Q—On which types of Automatic Brake Valves is the Pressure Maintaining Feature furnished?
A—There are two types: DS-24-M and DS-24-MC.

R8-Q—Describe the DS-24-M type briefly.
A—The DS-24-M brake valve is equipped with new type service application valve and filling piece. Both are different in design from the conventional DS-24 brake valve.

R9-Q—Describe the DS-24-MC brake valve briefly.
A—The DS-24-MC brake valve is known as the "converted" type, having the old standard service application portion and a new style filling piece.

The DS-24-MC Brake Valve

R10-Q—What portions are included in the DS-24-MC Brake Valve?
A—*1.* Brake Valve Portion, *2.* Rotary Valve Seat Portion, *3.* Service Application Portion, *4.* Filling Piece, and *5.* Pipe Bracket Portion.

R11-Q—How does the Brake Valve Portion function?
A—As with the older type brake valve, this portion, if equipped with hinged handle, permits manual sanding and hand control for suppressing a safety control application.

R12-Q—What does the rotary valve seat portion contain?
A—The seat for the rotary valve connects the various ports and passages in accordance with the brake valve handle positions and has attached to it a selector cock portion to provide either controlled or main reservoir supply when charging with the brake valve handle in release position.

R13-Q—What does the service application portion provide for?
A—As with the conventional brake valve, it provides a service application for train control, overspeed, or safety control operation.

R14-Q—What features does the filling piece portion of the DS-24-MC brake valve contain?
A—*1.* brake valve cut-off valve (double-heading cock), *2.* maintaining cut-off valve assembly, *3.* first service valve assembly, *4.* interlock cut-off valve, and *5.* equalizing portion.

R15-Q—Are the pipe bracket portions interchangeable?
A—They are interchangeable on the DS-24 and DS-24-MC types. The pipe bracket portion of the DS-24-M brake valve is not because of changes in air passages and pipe connections.

R16-Q—What portions are associated with the filling piece of the DS-24-MC brake valve?
A—*1.* maintaining cut-off valve assembly, *2.* brake valve cut-off valve assembly, *3.* first service valve assembly, *4.* equalizing portion, and *5.* interlock cut-off valve.

R17-Q—Describe the maintaining cut-off valve as incorporated in the DS-24-MC brake valve.
A—Located on the filling piece portion near the feed valve on the left side, the maintaining cut-off valve consists of a piston with "O" rings, piston spring, and a check valve and spring.

R18-Q—What is associated with the maintaining cut-off valve?
A—A positioning arrangement or pilot valve, consisting of a positioning lever, and piston with spring.

R19-Q—Describe the portions of the maintaining cut-off valve.
A—It has two positions: *IN*—handle of pilot valve toward engineman, and *OUT*—handle away from engineman.

R20-Q—What is the function of the maintaining cut-off valve?
A—To cut in or cut out the pressure maintaining feature.

R21-Q—Where is the brake valve cut-off cock assembly located and what are its functions?
A—Located nearest the engineman on the left side, the functions are the same as on the conventional brake valve—to cut in or cut out the brake valve and functions of the application portion on all locomotives but the one handling the brakes when operating multiple units.

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Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G449-Q—How may the tractive effort of the locomotive be judged?
A—The load indicating meter can be used as a "Pull Meter" to judge the tractive effort of a locomotive.

G450-Q—Can this same thing be determined by merely looking at the ground and listening to the engine exhaust?
A—No. This may give a false indication of the locomotives draw bar pull.

G451-Q—How is the loading F7 or FP7 locomotive arranged?
A—So designed that there is a gradual build-up of power.

G452-Q—Does the engineman's throttle determine the rate of increase in the generator output?
A—No. The electrical control is so designed that a device called the load regulator performs this function.

G453-Q—How is this accomplished if the throttle is opened rapidly.
A—If the throttle is opened rapidly, the rate of power build-up is controlled by the load regulator and a smooth start is assured.

G455-Q—What is the initial procedure when ready to start?
A—*1*—Place transition lever in the No. 1 position and move reverse lever to the desired direction. *2*—Place foot on safety control pedal and release the brake.

(Manual 2310, Page 211)

G456-Q—How should the throttle be operated?
A—Open the throttle one notch every one to two seconds to Runs *1*, *2* and *3*.

G457-Q—What should be noted when moving into Run *1*?
A—Note that the load meter starts moving to the right.

G458-Q—What should be noted when moving into Run *2*?
A—Note engine speed increase (at an easy starting place the locomotive may start the train in Run *1* or *2*.

G459-Q—Should the throttle be opened above Run *2* if the locomotive does not move?
A—Yes, to Run *3* or higher if necessary, until the engine moves.

G460-Q—Is it usually necessary to go above Run 3?
A—It is usually unnecessary to go above Run *3* but experience and the demands of the schedule will determine this.

G461-Q—What should be done if acceleration is too rapid?
A—In this case, reduce throttle one or more notches.

G462-Q—When can the throttle be advanced as desired?
A—After the train is stretched.

G463-Q—What must be done if the wheel slip indicator flashes repeatedly?
A—Reduce the throttle one notch. Apply sand as needed to prevent further slipping and re-open throttle when rail conditions improve.

G464-Q—Is it always necessary to take slack when starting?
A—It is generally unnecessary to take slack in starting, but there will be cases where it is wise to do so, after making sure that all brakes are released.

G465-Q—How should the throttle be handled when starting a train?
A—The throttle should be opened one notch at a time in starting a train.

G466-Q—How should a tonnage train always be started?
A—A tonnage train should be started in as low a throttle position as possible.

G467-Q—What should be borne in mind as regards the speed of locomotive?
A—The speed of the locomotive must be kept at a minimum until the train is stretched.

G468-Q—What action is sometimes advisable in order to prevent stretching the slack too quickly?
A—Sometimes it is advisable to reduce throttle a notch or two the moment locomotive begins to move to prevent the slack action.

G469-Q—How should the throttle be handled when the locomotive has moved far enough to completely stretch the train?
A—The throttle may then be advanced as quickly as desired, but not so quickly that slipping results.

(Manual 2310, Page 212)

G470-Q—How is smooth acceleration obtained?
A—By opening the throttle one notch each time the pointer of the load meter begins to move to the left.

G471-Q—When is it desirable to be in full throttle position?
A—Before reaching the speed at which automatic transition to parallel normally takes place.

G472-Q—What will this manner of operation serve to prevent?
A—This will prevent all units from making transition simultaneously.

G473-Q—What may result from transition being made by all units simultaneously?
A—It may result in an undesirable train surge.

G474-Q—When does the indicating meter pointer move to the left?
A—After the throttle is in the 8th notch and the train begins to accelerate, the indicating meter pointer will move slowly to the left.

G475-Q—In what position is the transition lever left if all units are operating in automatic transition?
A—In No. 1 position as long as the locomotive is under power.

G476-Q—Does automatic transition require any further attention from the engineman?
A—No. Forward and backward transition will automatically take place without any attention other than necessary throttle reductions to keep under speed restriction.

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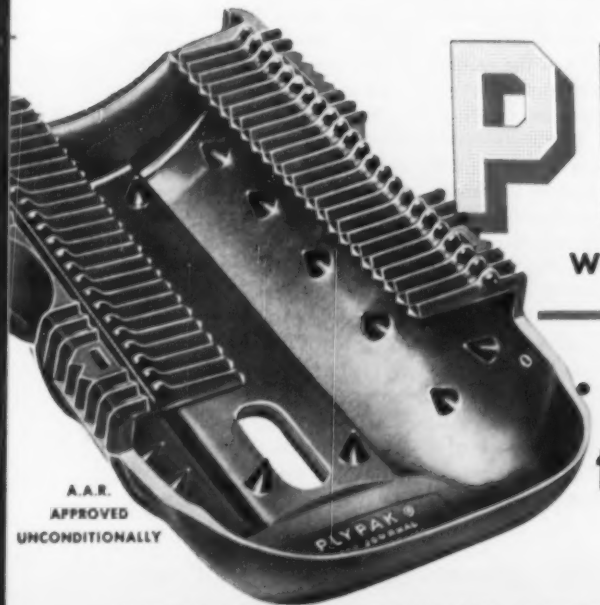

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Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F399-Q—How does the unit selector switch function?
A—Sets resistance in dynamic braking field loop control circuit according to number of units in locomotive.

F400-Q—How are the settings designed?
A—So that loop control current remains the same regardless of number of units in locomotive.

F401-Q—Describe the operation of traction motor field shunting pilot relay, forward sequence *(V)*.
A—Closes field shunting contactors M1 to M8 and is energized by *Vv*.

F402-Q—How does traction motor field shunting voltage relay, backward sequence *(Vc)* operate?
A—Controls backward field shunting sequence according to generator voltage.

F403-Q—What relay does it energize?
A—Pilot Relay *C*.

F404-Q—What is the function of *Vv* (traction motor field shunting voltage relay, forward sequence)?
A—Controls forward field shunting sequence according to generator voltage. Operates pilot relay *C*.

F405-Q—What is the duty of the voltage regulator *(VR)*?
A—Regulates auxiliary generator voltage.

F406-Q—What are the correct settings?
A—Idling, 72 volts. Full Speed, 75 volts.

F407-Q—What is the purpose of the radiator fan motor contactors *(W-1, W-4)*?
A—To connect radiator cooling fan motors to alternator.

F408-Q—How are they energized?
A—By TS-1, TS-4.

F409-Q—How do the wheel slip relays (WS-1, WS-2) perform?
A—They sound buzzer and light warning light at engineer's station when wheels slip on any unit; also automatically reduce power on unit affected by de-energizing contactor EFR.

LOCOMOTIVE OPERATION
Preliminary
Outside Check of Units.
Bulletin 1706 Sec. 104-A Page 1

F410-Q—What items should be checked before boarding locomotive?
A—Check for (*1*) oil and water leaks, (*2*) fuel supply shown on fuel tank sight glass, (*3*) Condensation in main reservoirs.

Interior Check on Each Unit

F411-Q—What should be checked immediately?
A—Check Supplies

F412-Q—If the engine is not already running, what should be checked before starting?
A—(*1*) Engine lube oil; (*2*) Steam generator water level.

F413-Q—After starting the engine what should be checked?
A—Governor oil, air compressor lube oil, engine water level and sand.

F414-Q—What else should be done?
A—(1) Check for leaks in piping system, (2) Release hand brake, (*3*) Check air compressor oil pressure.

F415-Q—What should be the compressor oil pressure?
A—From 5 to 20 psi, idle to full speed.

Bulletin 1706, Sec 104-A Page 2.

F416-Q—What other checks must be made?
A—Check breakers and switches in each unit.

F417-Q—What should be the position of the main battery switch?
A—*ON* on lead A and trailing A and B units.

F418-Q—What should be the position of the throttle handle?
A—*IDLE* in lead A and trailing A units. *OFF* in B unit.

Problem Page

IS IT TRUCK TROUBLE? (*Continued from page 72*)

ing stresses in helical truck springs and creates squeaking noises which are often attributed to supposedly dry center plates. Total elimination of car body rocking action independent of truck bolster action in cars equipped with center plates of pre-enlarged diameter has proved detrimental to good riding performances and quietness.

Lightweight cars equipped with tight-lock couplers supported by floating carriers are involved in more riding performance reports than are cars with couplers of older designs. When the coupler carrier seizes, the laterial and vertical movements of coupler are seriously restricted. The lateral action is transferred to the car body causing jerks at curves. Vertical movements are restricted to the coupler. The coupler which is locked tight to the adjoining coupler bounces free of its carrier and develops pounding noises that are intolerable.

Slack in couplers and draft gears also causes noise. Excessive travel in gear under compression or tension creates very disturbing noises. The buffer gear is affected by draft gear travel to further increase noise level. Excessive travel in draft gear, commonly termed "slack in draft," can be the result of fatigued recoil members, actual defects in any of the gear parts, or excess wear. Excess travel in draft gear will be reflected in longitudinal wear at the underside of the coupler shank. By observing the extent of such wear, inspectors can determine whether the car should be sent to the repair track for attention.

Our Mr. Hayes is a destroyer

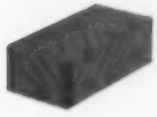
Bob Hayes is listed officially as Supervisor of Experimental Test and Production. But we refer to him as the "Destroyer" and encourage him in his efforts to run an O-P Diesel to death.

There's method in his madness, of course. Each accelerated test, under the worst possible engine operating conditions, condenses years of service into a few hundred hours.

If there's a weak part—we want to find it. If all parts prove strong—we want to find ways to make them stronger, last longer.

This continuing research is an important part of Fairbanks-Morse's customer service. It is the basis for our constant product improvement—part by part.

Fairbanks, Morse & Co., 600 So. Michigan Avenue, Chicago 5, Illinois.



Be sure you get the Dividend of Quality—specify genuine Fairbanks-Morse replacement parts. They are identified by the orange carton—and the Fairbanks-Morse Seal of Quality.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL LOCOMOTIVES AND ENGINES • RAIL CARS AND RAILROAD EQUIPMENT • ELECTRICAL MACHINERY • PUMPS • SCALES • WATER SERVICE EQUIPMENT • MAGNETOS

THE FOREST PRODUCTS COMMITTEE OF THE AAR SAYS—

"BUILD FREIGHT TRAFFIC with this car!"

This is INTERNATIONAL'S PERMANENT BULKHEAD FLAT CAR. One man, with a lift truck, can load or unload it in little more than an hour. It requires considerably less securement, saves time in adjusting shifted loads and in car shopping.

Read what the committee says about this car:

". . . the permanent bulkhead flat car offers big opportunities to both the lumber *and* the railroad industries.

". . . it cuts loading and unloading costs by as much as 75%.

"it can handle 95% of ALL flat car lading.

". . . it OFFERS THE RAILROADS AN OPPORTUNITY TO BUILD FREIGHT TRAFFIC."

INTERNATIONAL STEEL COMPANY

EVANSVILLE 7, INDIANA

RAILWAY DIVISION

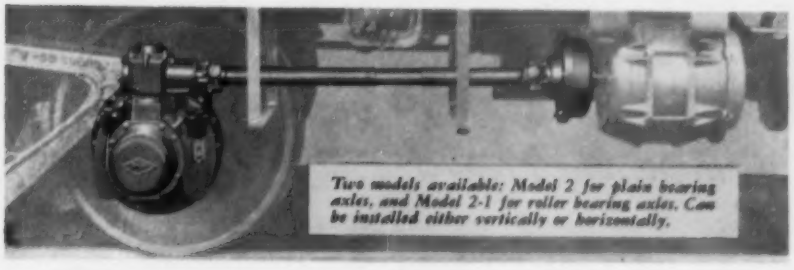
from ample electrical current supplied by the new ½ to 5 KW Spicer Generator Drive

Specific demands for electrical current in modern railroading . . . especially in baggage, mail, refrigerator and caboose cars . . . are met amply, steadily and reliably by the Spicer ½ to 5 KW Generator Drive.

The new Spicer Drive delivers the power for this ½ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer Positive Gear Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lights, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

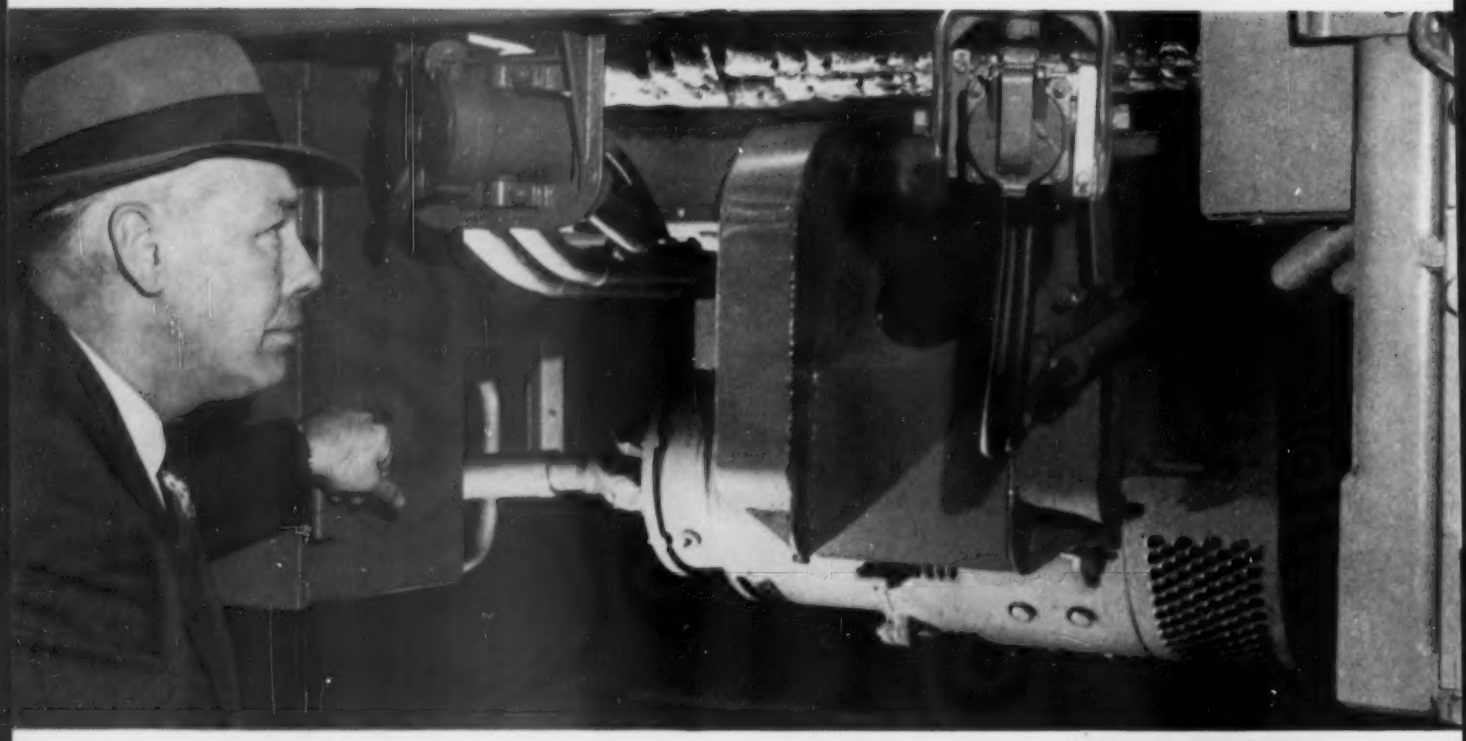
Spicer Positive Railway Generator Drive can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.



Two models available: Model 2 for plain bearing axles, and Model 2-1 for roller bearing axles. Can be installed either vertically or horizontally.

Spicer

DANA CORPORATION
Toledo 1, Ohio

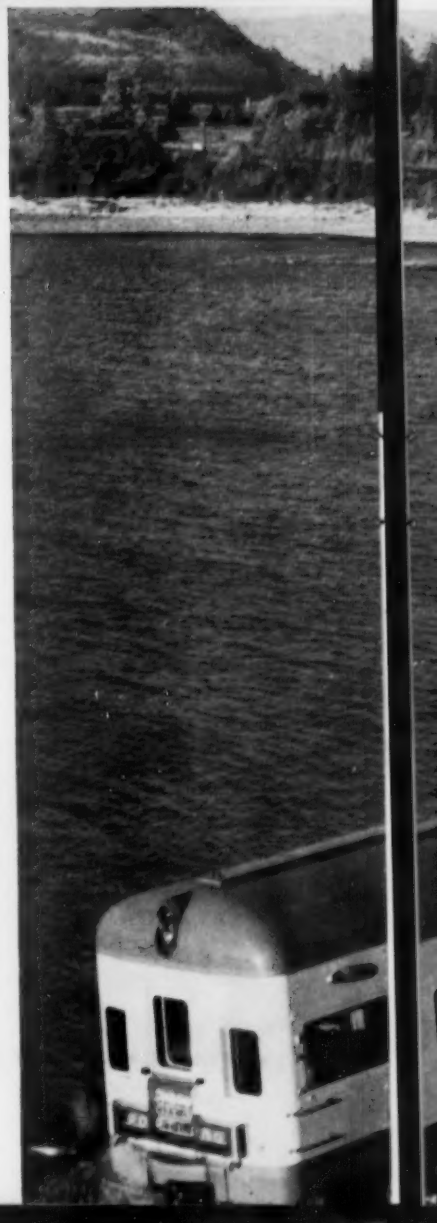


G-E Axle-driven Motor Generators Help Provide Comfort and Convenience Aboard Union Pacific Streamliners

General Electric's new GMG-162 axle-driven motor generator now in use on Union Pacific trains has more reserve power than competitive equipment. Here's what that means:

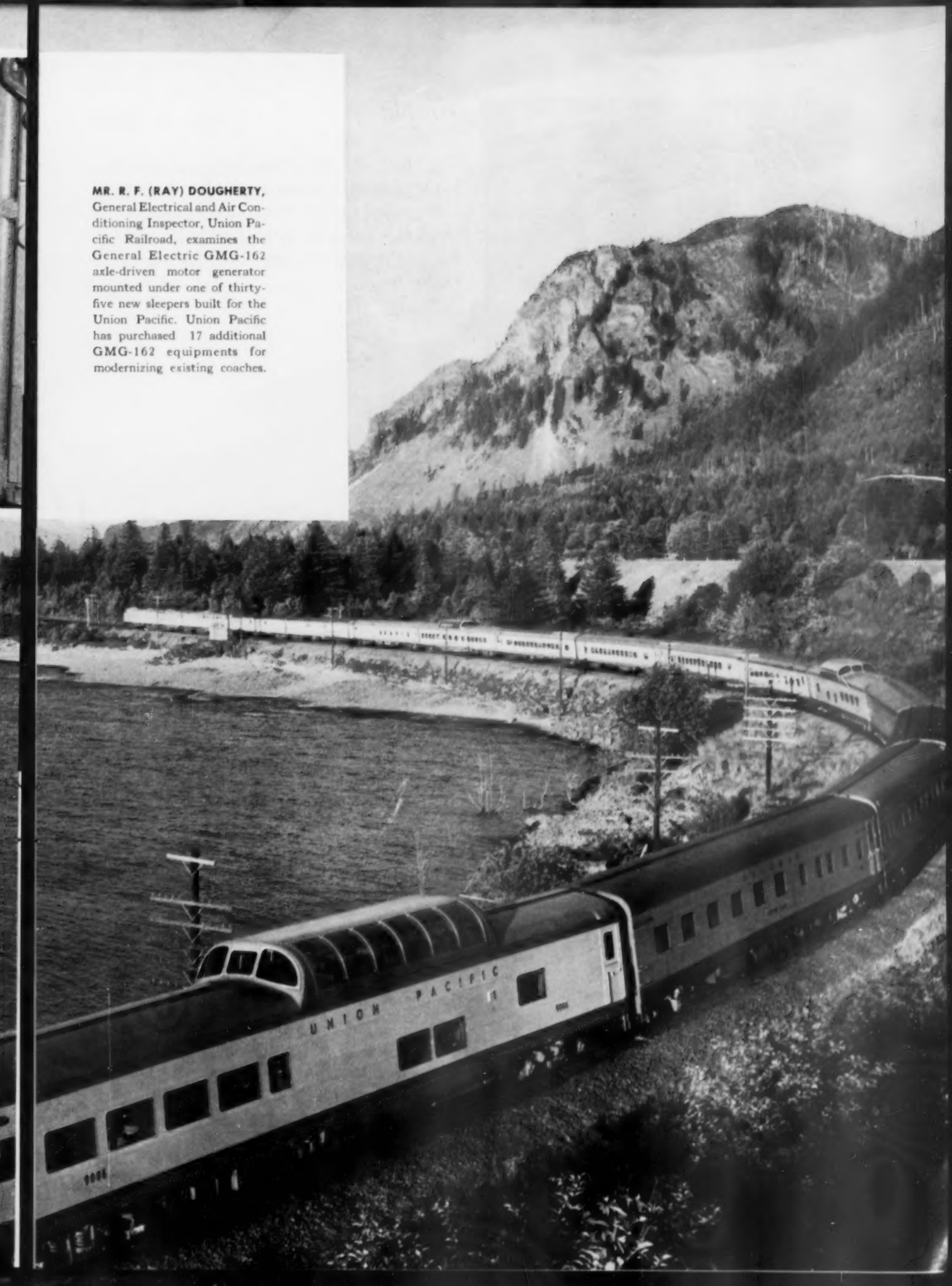
1. Better battery record. There is ample power available to charge low batteries while the car is in operation. Therefore, fewer standby rechargings are required.
2. Should axle generators in other cars become inoperative, increased demand can be met effectively. In a recent test simulating emergency conditions, load requirements of four modern air-conditioned passenger cars were supported by one GMG-162.

In addition, General Electric's GMG-162 has a highly simplified control system, uses only two control panels, eliminates armature reversing switch, and reduces number of moving parts. This results in low cost installation and maintenance. For more information contact your G-E Apparatus Sales representative. Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. 115-10



Progress Is Our Most Important Product

GENERAL ELECTRIC



MR. R. F. (RAY) DOUGHERTY, General Electrical and Air Conditioning Inspector, Union Pacific Railroad, examines the General Electric GMG-162 axle-driven motor generator mounted under one of thirty-five new sleepers built for the Union Pacific. Union Pacific has purchased 17 additional GMG-162 equipments for modernizing existing coaches.

simple

The "Redipak" lubricating pad is a square block of foam neoprene, molded with cored passages and covered with cotton wicking material. It is installed—without any other packing—in the standard journal box without jacking the box.

Stop Hot Boxes!

"Redipak" Lubricating Pad points the way toward elimination of the hot box problem

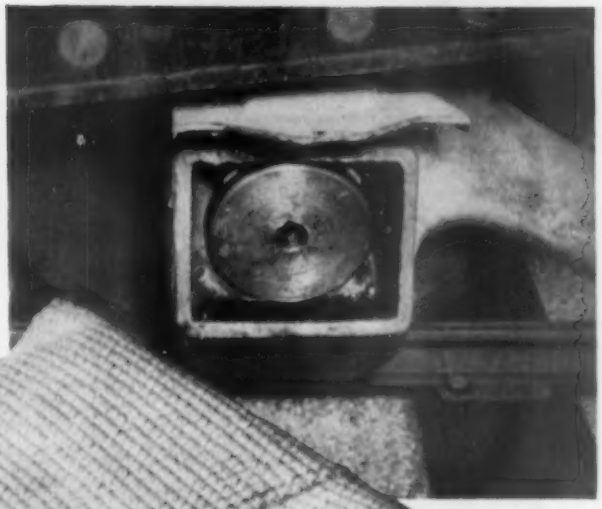
foolproof

The square "Redipak" lubricating pad is fully symmetrical—it can be installed any side out, either face up. It can be inserted by hand or with a "Redipaker"—a simple bent rod which speeds up the work—and is removed with a standard packing hook.

No waste... with "Redipak"!

cool-running

The "Redipak" lubricated bearing has operated as much as 50°F. cooler than waste-lubricated bearings, under certain conditions. In laboratory starvation tests, with no free oil in the box, the "Redipak" retained enough oil for 10,000 miles of high speed operation.



long-lasting

In service tests, "Redipak" lubricating pads have operated over 90,000 miles each, without noticeable wear. No pad has shown any sign of glazing. Inspection of the bearings shows that the pads do not lint.

AMERICAN
Brake Shoe
COMPANY

NATIONAL BEARING DIVISION
ST. LOUIS 10, MISSOURI

Atlanta &

Wyandotte cleaning products to keep

The constant care given these beautiful diesels keeps them bright and new looking . . . even after years of day-and-night service hauling the crack Piedmont Limited, Crescent Limited, and fast-moving, heavy-tonnage freight trains.

Public-minded, the Atlanta & West Point, and the Georgia Railroad both know the importance of cleaning their equipment *regularly and well.* For it keeps housekeeping costs down—equipment is much more attractive, more efficient, and remains serviceable longer.

Constant care, in their case, includes the use of the following Wyandotte cleaning products:

Wyandotte 11, for filters, liners, heads, and other diesel parts; Wyandotte 20, for trucks and underframes; Wyandotte 21, for paint stripping; Wyandotte 30, for interior cleaning of diesel units; Wyandotte Rillor (the mild, effective, alkaline cleaner that maintains high gloss), for diesel exteriors and other equipment; Wyandotte A. E., for cleaning air-conditioning units, condensers, and evaporators; Wyandotte Zorball, long-lasting grease and oil absorbent.*

Call in your helpful Wyandotte representative today. He can demonstrate the many Wyandotte products which are designed for better railroad cleaning. *Wyandotte Chemicals Corporation, Wyandotte, Mich. Also Los Nietos, Calif. Offices in principal cities.* *REG. U.S. PAT. OFF.

WYANDOTTE CHEMICALS

Specialized Cleaners, Methods, Service

West Point, and Georgia Railroad use

diesels looking new, save money

Wyandotte
CHEMICALS

J. B. FORD DIVISION

Complete line of cleaners for all railway needs

WYANDOTTE CHEMICALS CORPORATION,
WYANDOTTE, MICHIGAN

Gentlemen: I would like more information on Wyandotte railway-cleaning products.

☐ Have representative call on me.

☐ Send FREE book on "Railway Cleaners and Cleaning Procedures"

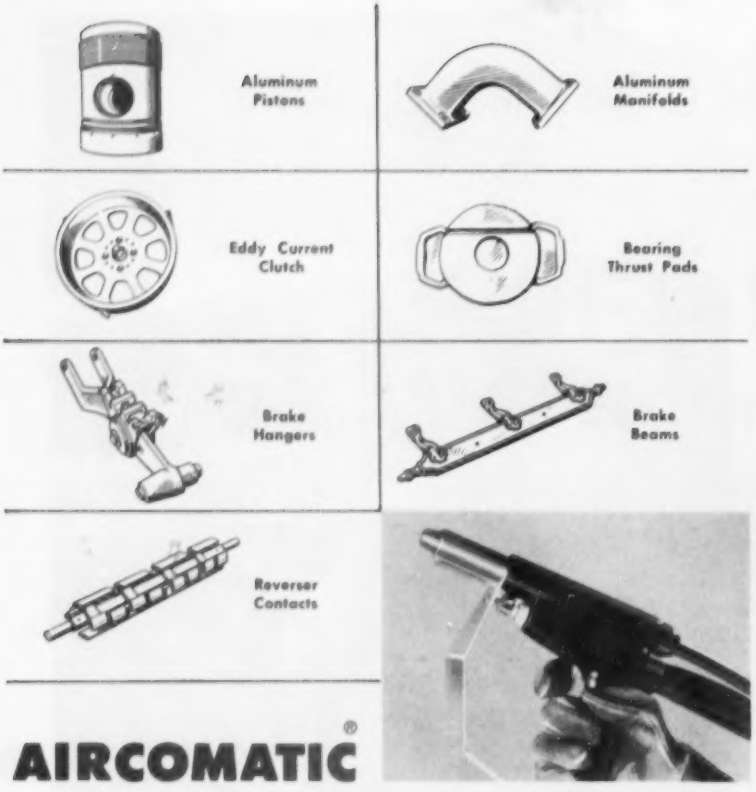
Name_____

Railroad_____

Department_____

Address_____

City_____ Zone____ State_____



AIRCOMATIC®

reclaims them all

Reclamation of aluminum, steel and bronze diesel engine parts with Aircomatic is fast becoming standard practice in the railroad industry.

Aircomatic welding is an inert-gas, shielded arc process using a consumable wire electrode. The basic unit, manual or automatic, designed and manufactured by Airco, includes the welding head, carriage assembly for wire drive and control equipment, cables, hoses, and flexible wire casing.

Airco shielding gases include both helium and argon, produced by Airco, or mixtures thereof for particular requirements. Pure carbon dioxide gas is also available, from Airco for use as a shielding medium where applicable.

The consumable wire electrode is produced to rigid Airco specifications as to purity, cast, and metallurgical content. Normally supplied on expendable spools, Aircomatic wire is available in alumium, steel, stainless steel, nickel, titanium, copper, and copper base alloys.

Aircomatic is a direct-current welding process. A complete line of Airco motor-generator and rectifier type welders are designed for Aircomatic characteristics—the latest of which is a new constant potential 800 amp ACV welder.

Other Airco inert-gas welding processes include Aircospot and Heliwelding. Write today for details.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

AIRCO® **AIR REDUCTION SALES COMPANY**

A division of Air Reduction Company, Incorporated, New York 17, N. Y.

Offices in most principal cities

On the west coast — Air Reduction Pacific Company

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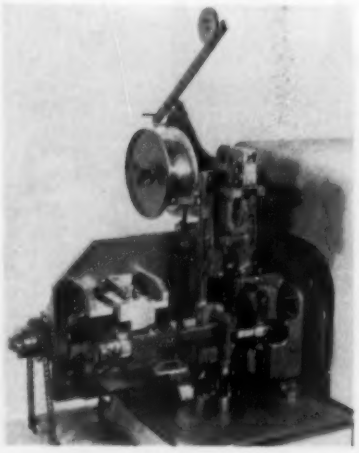
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.

EQUIPMENT

(Continued from page 22)



Tag Wiring Embossing Machine

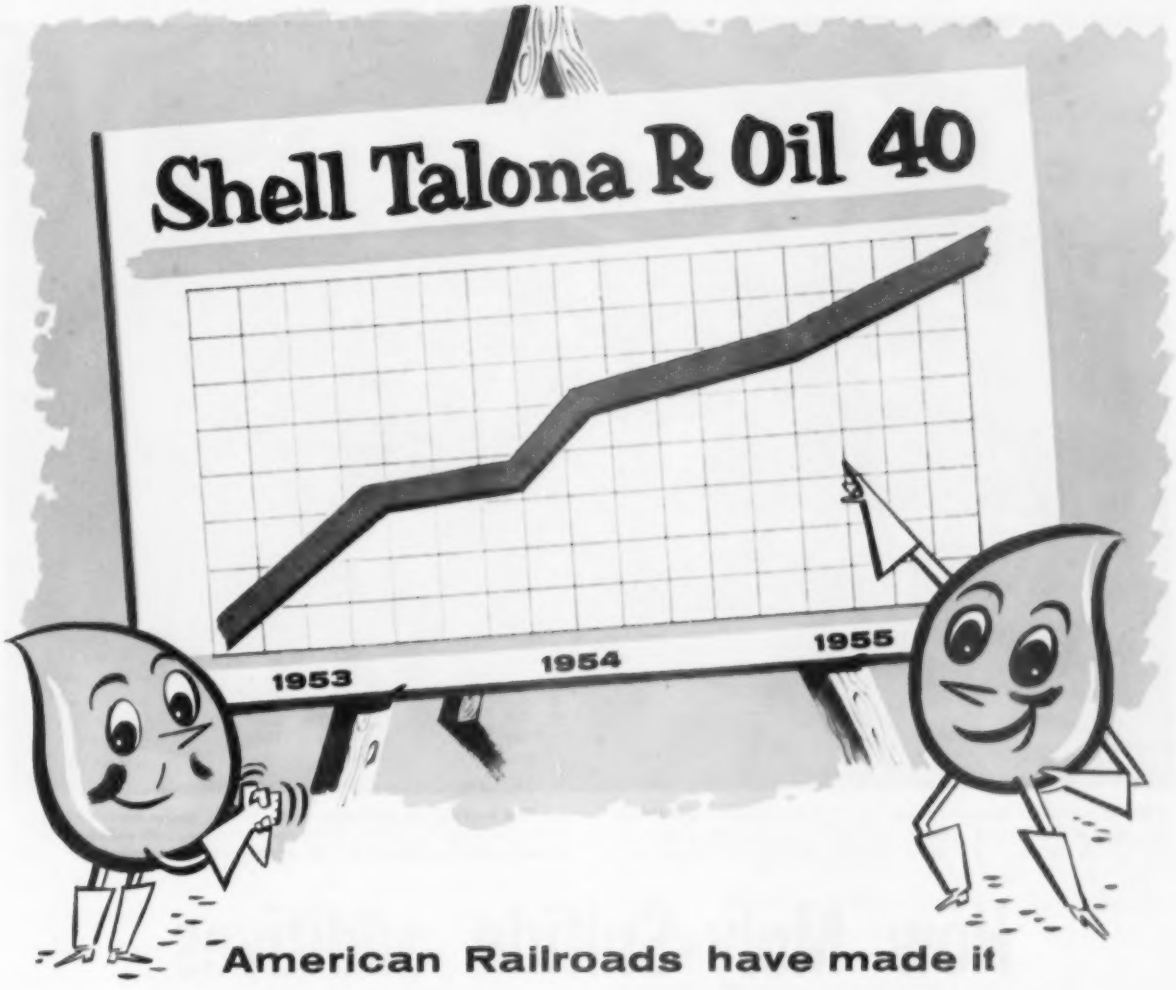
The Databosser, an automatic device, attaches tying wires simultaneously with embossing fixed and variable data on metal identification tags at the rate of 75 per min. According to the manufacturer, the railroad industry can achieve lower costs through improved controls and systematic identification of parts-in-process, raw material and finished products.

At rated production, the unit can simultaneously emboss sequence numbers, notch plates for coding or sorting and coat tops of embossed characters for easier reading. Without the wiring operation, a rate of 100 tags per min can be achieved. In order to thread wire into the tag, cut off a uniform length and make a securing twist, the unit goes through 15 different mechanical motions in less than 1 sec. *Dashew Business Machines, Inc., Dept. RLC, 5886 Smiley drive, Culver City, Cal.*

Non-Ferrous Tools

The line of Flex-Flo tools, including hammers, sledges, and drifts, is now available in any combination of 15 sizes and 5 alloy hardnesses. It is said that these non-ferrous tools, with hole-in-the-head construction,

(Continued on page 94)



American Railroads have made it the fastest growing diesel locomotive lubricant in the U. S. A.

The acceptance of Shell Talona R Oil 40 by American railroads has been remarkable. Today, whether judged by number of units or horsepower, this lubricant is outstripping all others in rate of growth.

There is good reason for this: Maximum engine performance can be expected when you use Shell Talona R Oil 40.

Superior anti-wear protection

Greatly reduced wear on pistons, rings and cylinder walls is assured because of the selected combination of additives used in Shell Talona R Oil 40.

Maintains engine performance

The balanced formula of Shell Talona R Oil 40 combines high oxidation stability and anti-corrosive power. It prevents fouling and has excellent detergent-dispersant action.

For further information write to the Shell Railroad Sales Department.

SHELL OIL COMPANY

50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California
Shell Building, St. Louis 3, Missouri

SHELL

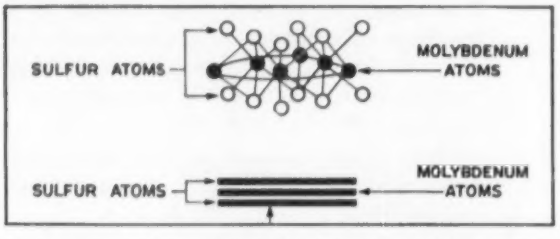
Effective lubrication of torsion suspension bushings of heavy duty trailers has been a maintenance problem with many truckers. The bushing at the left was removed still in good condition after 160,000 miles of service. This bushing was lubricated with a chassis grease containing Moly-Sulfide additive. The bushing at the right, lubricated with ordinary chassis grease, needed replacement after 35,000 miles of service.

How Moly-Sulfide additives EXTEND EFFECTIVE LUBRICATION

Why Moly-Sulfide additives are used in lubricants by trucking fleet operators, railroads, aircraft and automotive manufacturers, oil well drillers and steel mills.

Moly-Sulfide has six characteristics which make it an ideal lubricant additive wherever mechanical action wipes or shears off the hydrodynamic film.

1. Because of its affinity for metals, Moly-Sulfide readily forms a film on metal surfaces.
2. Moly-Sulfide has a low coefficient of friction.
3. It has a high factor of durability.
4. Moly-Sulfide has a thermal stability of −100°F. to +750°F.
5. It has a high chemical resistance to acids, alkalis and water.
6. It withstands high pressures, having a low shear strength and a high film strength.

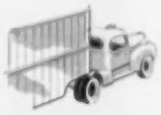


Above, structural diagram of the Moly-Sulfide molecule. Below is a functional illustration of the laminar structure. Each lamina is composed of a layer of molybdenum atoms with a layer of sulfur atoms on each side.

What is Moly-Sulfide and how does it function in lubrication?

Mined in Colorado as molybdenite, purified Moly-Sulfide is a lead-grey material. It has a laminar molecular structure, with the Moly atoms sandwiched between layers of sulfur. (See illustration.) The sulfur atoms have an affinity for metal and

bond readily to metal surfaces, giving the film a *low shear strength*. This affinity is caused by a strong intermolecular bond between sulfur and metal. The lubrication results from the easy slippage of sulfur-to-sulfur atoms. As an additive to lubricants, the *Moly-Sulfide will readily form a film and when a grease or oil film is wiped away or sheared off, the Moly-Sulfide film sustains lubrication until a petroleum film reforms.*



Truck and passenger car builders and operators are making wide use of Moly-Sulfide greases for difficult lubrication jobs.

Lubricants containing Moly-Sulfide additive have over 30 established uses in the automotive, aircraft, railroad, oil drilling and steel industries.

Since Abraham Lincoln's time, railroads have been faced with a serious, recurring, *expensive* problem: hotboxes. Right now more than 14 million journal bearings are carrying heavy loads at high speeds on American railroads. These railroads have to deal with an average of 183,000 hotboxes a year at a cost of some $90,000,000.

Initial field tests by at least three leading railroads have shown hotboxes can be reduced materially by the use of grease containing Moly-Sulfide. A way has been devised to apply greases containing Moly-Sulfide on the journals of railroad equipment. This application is supplemental to the oil waste system and as a result the Moly-Sulfide films that are formed sustain lubrication until the oil film is reestablished.

American automobile and truck manufacturers and their customers are now using lubricants containing Moly-Sulfide additive in at least 14 different applications. These include chassis points, ball joint suspensions, torsion suspension assemblies, fifth wheels, shackle bolts, king pins, valve stems, automatic window mechanisms, wind-shield wiper mechanisms, seat adjusters, drive shaft splines.

In aircraft, Moly-Sulfide is added to aircraft greases. In jet engines under exacting conditions of temperature and pressure it is used on turbine shafts, splines and gear reduction units.

In other industries, Moly-Sulfide is being used in lubrication jobs which formerly presented serious difficulties. A Florida cement plant is using gear compound containing Moly-Sulfide to lubricate rack gears and a Michigan manufacturer uses Moly-Sulfide as an additive to drawing compounds for drawing stainless steel hub caps. In New York a baker of crackers and cookies is using Moly-Sulfide grease for lubrication of oven chains which must operate at high temperatures. In Louisiana an oil well drilling contractor is using Moly-Sulfide additive in tool joint compounds. He reports that disjointing when drilling below 15,000 feet is no problem now: no galling, welding or stripped threads.

Aircraft manufacturers are using Moly-Sulfide greases on many types of ball and joint suspension lubrication.

Oil well drilling contractors are using Moly-Sulfide additives to tool joint compounds.

Lubrication engineers are offered information and help in evaluating the use of Moly-Sulfide as an additive to lubricants by the Climax Molybdenum Co.

Currently Moly-Sulfide is being investigated by many petroleum research laboratories and lubricant users. They are interested in studying, under practical working conditions, the ability of Moly-Sulfide to increase effective lubrication.

If insuring effective lubrication is a problem facing your company, Moly-Sulfide additives may be a solution. Climax Molybdenum Company is the principal source of this product. If you need authoritative information, please get in touch with us and we will be pleased to send you literature on Moly-Sulfide and the sources of supply for experimental lubricants containing Moly-Sulfide.

Department 59
CLIMAX MOLYBDENUM COMPANY
500 Fifth Avenue, New York 36, N. Y.

Please send me the following:

Literature
1. "Moly-Sulfide, Lubricant Additive" ☐
2. "Moly-Sulfide in Chassis Grease" ☐
3. "Moly-Sulfide Specification and Properties" ☐

List of Sources for
1. Railroad Greases ☐
2. Chassis Greases ☐

Sample — One-ounce tube of Moly-Sulfide ☐

Name .....

Position .....

Company .....

Address .....

CLIMAX MOLYBDENUM

GAIN THESE ADVANTAGES with MET-L-WOOD

METAL BONDED TO PLYWOOD

for new and rebuilt Passenger Car Interiors

FAST ASSEMBLY with Met-L-Wood, whether you fabricate in your shops or use prefabricated Met-L-Wood panels made to your exact specifications.

LIGHT WEIGHT Met-L-Wood panels can reduce weight to as low as 27% of the weight of comparable steel construction.

SOUND-DEADENING value of Met-L-Wood reduces outside noise levels, and is particularly valuable as sound-isolation when used for compartment partitions and doors.

VIBRATION DAMPING effect of Met-L-Wood helps prolong car life — gives passengers extra comfort.

and Smooth, Durable Beauty!

Whether plastic, painted steel, stainless steel, or aluminum, the smooth sweep of Met-L-Wood panels adds beauty to any car interior. Tough, abuse-resisting surfaces keep car interiors new-looking for years.

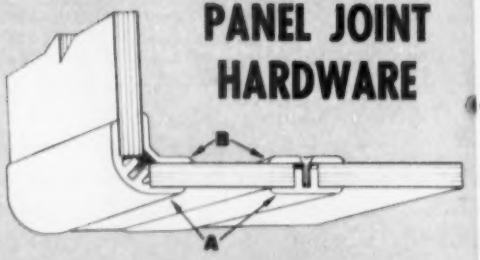
Details and technical data on Met-L-Wood panels, doors and partitions will be sent promptly on request.

Write for Bulletins 520 and 521

MET-L-WOOD CORPORATION

6755 West 65th Street, Chicago 38, Illinois

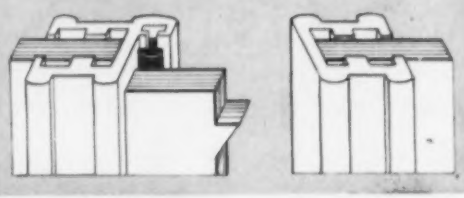
PANEL JOINT HARDWARE

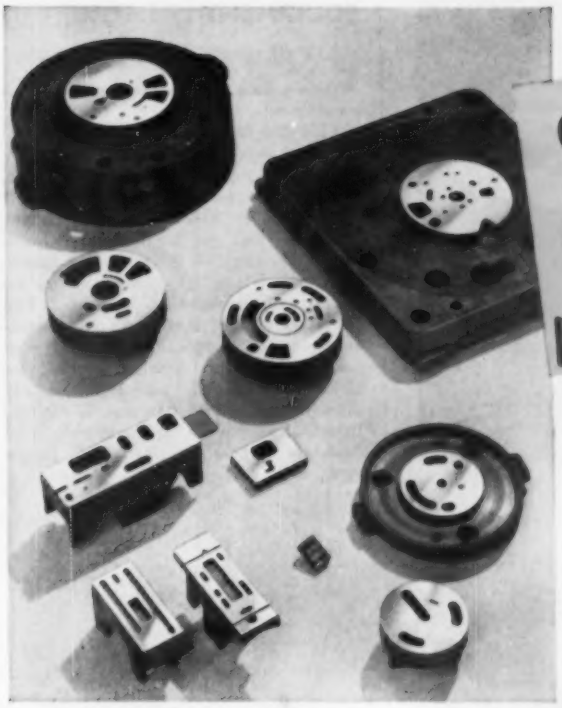


Met-L-Wood panels can be joined quickly and easily with these trim extruded aluminum units. Strips A have grooved slots which provide strong threads for standard 10-24 machine screws anywhere along the length. Strips B can be drilled for screws at convenient points along the panel joint.

PANEL EDGE FITTINGS

Extruded aluminum fittings for Met-L-Wood panel edges improve partition and door appearance and give permanent edge protection. Left below is the fitting for door stops. Keyed slot holds molded rubber bumper firmly and permanently. At right is edge fitting for sliding doors and partition edges. Both fittings are easy to install on Met-L-Wood panels.





Get Precision Flatness, Finish and Parallelity on Valve Parts Like These . . . In Production Quantities With a

Lapmaster®

Air brake valve parts like these are being production lapped on JOHN CRANE Lapmasters every day at a tremendous savings in time and money. For instance, one of the rotary valve seats shown here formerly required over two hours of lapping time to pass the "no leak" bubble test — time has now been cut to ten minutes on the Lapmaster.

This is the machine for you if you are looking for precision flatness and finish in quantity on all forms of ferrous and non-ferrous metal, ceramics, plastics or crystals. Lapmasters readily lap to the extremely close tolerance of one light band (.000011") or less. They also produce a fine finish to as low as 1 RMS.

You are invited to send us a few sample parts including surface finish specifications and approximate production requirements. Our lapping laboratory will then be in a position to provide you with complete facts on the application of the Lapmaster to your work. There is no obligation.

Crane Packing Co., 6470 Oakton St., Morton Grove, Ill. (Chicago Suburb)
In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont., Canada

Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Spent mixture drains off through serrations in lap plate
Conditioning rings serve as standard workholder
Conditioning rings keep lap plate flat automatically

*Protected by United States and Foreign Patents.

FREE TECHNICAL DATA

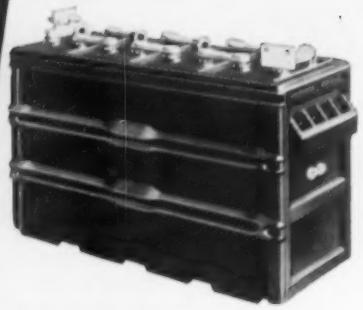
on the Lapmaster is available on request, also information on measuring flatness. Write for your copies today.

Lapmaster DIVISION

CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

START FAST!
COOL QUICK!
with C&D
RAILROAD BATTERIES



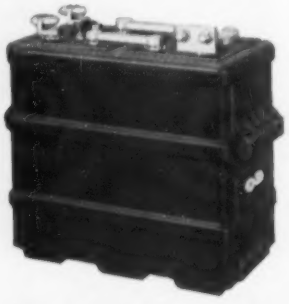
Use C & D Slyver-Clad* batteries in your equipment. Why? Because C & D batteries meet all the requirements for rugged railroad service. Each powerful, heavy-duty positive plate has five separate layers of insulation. Because of this famous method of insulation and retention "shedding" is no longer a determining factor in battery life. Thus with C & D batteries you get longer life, higher capacity!

*T.M. Reg.

C & D Diesel starting batteries give:

1. High sustained voltage
2. Reduced maintenance requirements
3. Reduced connection loss

For complete details, write for Bulletin DL-576



C & D Carlighting and Air Conditioning batteries give:

1. Lowest annual cost
2. Steady uniform voltage
3. Reduced maintenance requirements

For complete details, write for Bulletin AC-546

C&D BATTERIES, INC.
of Conshohocken, Pa.
Industrial Batteries Since 1906
Sales and Service Offices in Principal Cities from Coast to Coast

EQUIPMENT

(Continued from page 88)

provide a unit with specific job hardness requirements.

They have been designated standard, "S," "B," "C," and "D" alloy. The standard may be used to replace lead, babbit, copper, brass, etc. It provides a tool of 35 Brinell hardness. The "S" or dead soft will not mar steels and can be used for delicate operations. The "B" is for use on harder tools and driving operations and has an approximate hardness of 50 Brinell. The "C" is said to be right for driving hardened pins and wedges without chipping or flaking. It has an approximate hardness of 95 Brinell. The "D" alloy is for unusual cases where extreme hardness is desired. Brinell hardness is approximately 150. *Custanite Corporation, Dept. RLC, Larchmont, N.Y.*

Paint Spray Gun

The P-300 is an air-operated syphon paint spray gun designed to operate on air pressure as low as 5 psi. It is light in weight and has a paint cup capacity of one quart. The gun can be used for the application of oils or corrosion inhibitors as well as diverse painting operations including striping, touch-up and stenciling. *John B. Moore Corporation, Dept. RLC, P. O. Box 3, Nutley 10, N. J.*

Self-Propelled Welding Unit

The Weldmobile is a self-contained, self-propelled welding unit, with engine directly coupled to the generator, not with a tractor with a generator driven through power take-off. It was designed to provide a mobile unit for installations in which welding applications occur at widely sepa-

NOW...

400,000

CAR SETS!

Excuse us . . . please . . . our figures are showing again!

By March 1, 1956, our sales had *passed* the 400,000 mark. Actually, we now have sold 415,000 car sets of Barber Stabilized Trucks to more than 100 major railroads and private car lines in the United States and Canada.

We mention these new facts for *two* reasons: (1) There is no *better* way to convey to you the endorsement which the railroad industry has given our products; the leadership they have conferred on our company. (2) We're just plain *proud!* Standard Car Truck Co., 332 South Michigan Avenue, Chicago 4, Ill. *In Canada:* Consolidated Equipment Co., Ltd., Montreal 2.

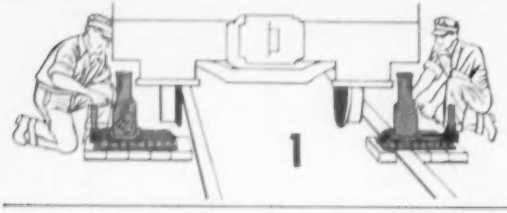
Specify Smoother-Riding

BARBER

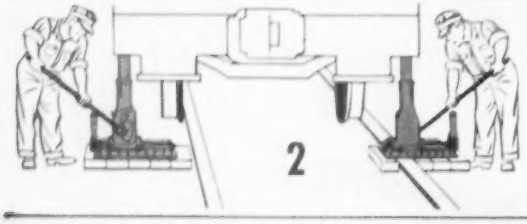
STABILIZED TRUCKS

How to get back on the track quickly

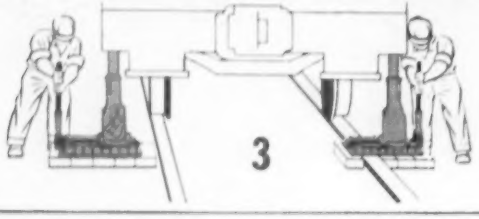
Without A Crane!



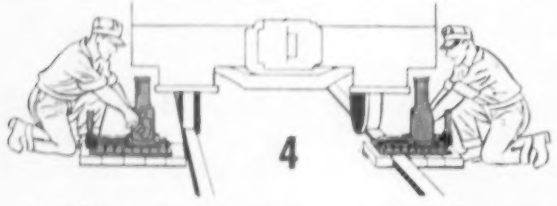
Place a Duff-Norton traversing base and jack beside each derailed truck.



Jack up the car or locomotive until wheels clear top of rails.

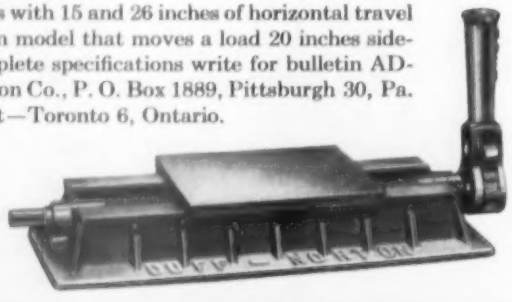


Move jacks horizontally simultaneously on traversing bases until wheels are in alignment with rails.



Lower wheels; you are back on the track, quickly, inexpensively and without danger of distorting car or locomotive frame.

Duff-Norton traversing bases are available in two 50-ton capacity models with 15 and 26 inches of horizontal travel and one 100-ton model that moves a load 20 inches sideways. For complete specifications write for bulletin AD-4-G, Duff-Norton Co., P. O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.



DUFF-NORTON

"Giving The Railroads A Lift Since 1883"

Jacks

rate points. Towing capacity is rated at 2,000 lb draw-bar pull.

The unit is available in two capacities. The 400-amp model is powered by a Chrysler 6-cylinder industrial engine; the 600-amp model, by a Chrysler V8-cylinder engine. The unit can also supply up to 1 kw of 110 volt dc auxiliary power for operation of lights and motor powered equipment.

Two wells and brackets at the rear are for acetylene and oxygen tanks. Welding, traveling and power controls are on a special dashboard in front of the driver's seat. *Hobart Brothers Co., Dept. RLC, Hobart Square, Troy, Ohio.*

Heavy Duty Jig Saw

This heavy duty jig saw can perform bevel cuts on either side up to 45 deg. It has a 1-in. stroke that can cut from a depth of 2 in. at 90 deg to 1¾ in. at 45 deg. The tool is equipped with a universal motor to make straight, curved, sharp radius and irregular cuts through a 2 by 4, or, with the proper blade, through plywood, metal sheets, rods, tubes, plastics, fibre glass, Masonite, and leather.

Vibration is eliminated through a dynamically balanced reciprocating action that minimizes operator fatigue during periods of continuous operation. The line of cut is blown free of chips by a forced air flow that cools the motor and then is directed through the tool housing to the cutting edge. Weight of the jig saw is 6 lb. *Black & Decker Mfg. Company, Dept. RLC, Towson 4, Md.*

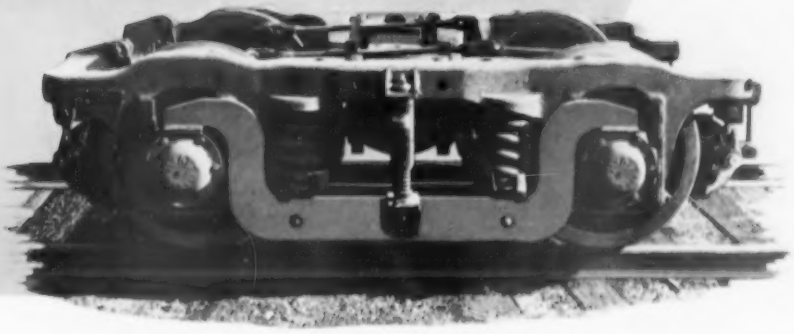
Gate Valve

The union-bonnet, rising-stem gate valve has been introduced to replace solid and split-wedge rising-stem screwed-bonnet valves. The two-piece, radial-seat union bonnet has an accurately machined, true ball-and-socket style radial joint. This is said to insure a tight body-to-bonnet as-

(Continued on page 100)

Cars built by General American Transportation Corporation

Commonwealth BX Truck



Here's Progress!

500 New Refrigerator-Express Cars for RAILWAY EXPRESS AGENCY Equipped with Commonwealth BX Type Trucks

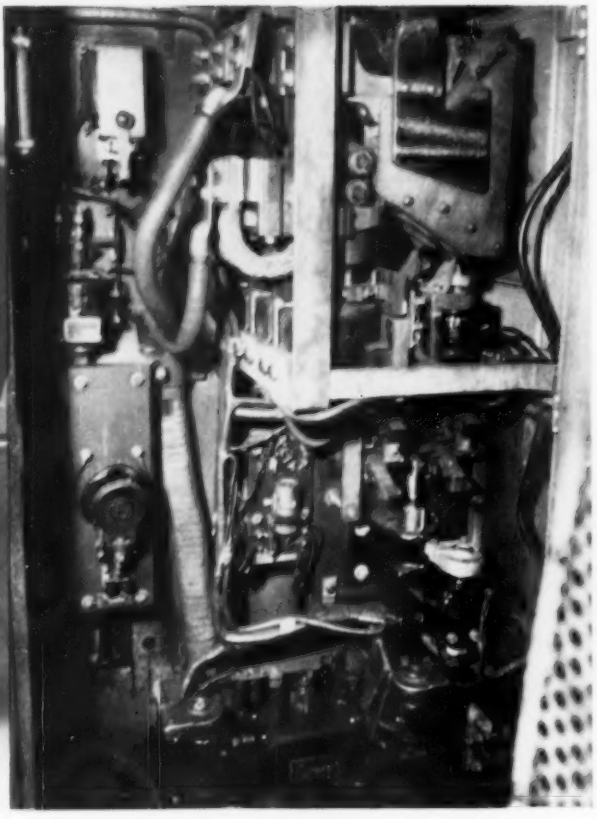
Because of many years of outstanding performance of Commonwealth Trucks on cars of the Railway Express Agency and railroads throughout the country, this new lot is equipped with latest design Commonwealth BX Type Trucks. When not transporting perishables from the west coast and the south, these cars are used for LCL express shipments and bulk mail handling in fast train schedules.

Equalizers, swing bolsters, coil springs and friction snubbers combine to provide smooth, safe riding of light or loaded cars, protecting car contents, thereby minimizing damage claims. The rigid one-piece cast steel truck frames with integral cross transoms and pedestals insure axles being in tram at all times.

Commonwealth BX Trucks are approved for all types of Express-Refrigerator, Box-Express and Merchandise cars operating in all classes of passenger trains. For dependability and true economy be sure to specify Commonwealth Trucks.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. EDDYSTONE, PA.



Simplex Diesel Locomotive Cable wears an *EXTRA TOUGH JACKET* against Abrasion, Heat, Water, Oil and Acids

- Simplex makes a cable for Diesel locomotives.
- It's insulated with a special rubber compound that heat won't crack or make brittle.
- It has a tough jacket that withstands abrasion, acids, heat, oil and moisture.
- Type A is built for use in conduits, cabinets and terminal boxes.
- Type B is for exposed locations. Type B is a sturdier cable with an extra heavy, reinforced jacket.

For detailed information, ask the Railroad Department at the address below

Simplex Diesel Locomotive Cable

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

8,400,000 CAR-MILES

—*No journal Bearing Failures!*

for 670 UNI-PAK® equipped hoppers

Patented

in 12 months of continuous service

(details of this intensive-in-service test supplied on request)

120,000 UNI-PAK Lubricators giving exceptional service on 30 Railroads

36-month repack period authorized
(on limited basis)
Gives maximum service

UNI-PAK's 3 way
Constant FILTERED oil feed for better, safer journal lubrication

The exclusive UNI-PAK design features: (1) Three-inch pad of foam neoprene that holds 6-7 pounds of oil—*more than any other lubricator.*

(2) Specially developed lubricating yarns, continuously sewed through the neoprene pad and terminating in loops at top and bottom, deliver a *constant feed of filtered oil.* These yarns will not glaze.

(3) Rugged cotton body increases capillary attraction; buffers keep pad properly positioned and take up wear at fillet and collar.

WRITE FOR FULL DETAILS

UNI-PAK CORPORATION

BOX 8302 SWISSVALE, PA.

366 MADISON AVE., New York 17, N. Y. • 120 SO. LA SALLE ST. Chicago, Ill.

3 EASY STEPS TO SAVE YOU MONEY!

1 Start with dirty, carbon encrusted diesel engine liner (or any other diesel parts to be cleaned).

2 Place the liner (or any other diesel parts to be cleaned) in cleaning basket and submerge into Lix Diesel Klean Heavy.

3 In less than half the usual time inspect the diesel liner, (or other diesel parts) . . . and when thoroughly cleaned, just rinse with water or mineral spirits.

You get THIS . . .

AT LESS COST, BECAUSE "LIX DIESEL KLEAN HEAVY" SOAKS AWAY CAKED CARBON.

No brushing or scraping is necessary. Time and hard labor is reduced to a minimum. Lix is harmless to all types of metals during their cleaning cycle.

Pistons, Bearings, Injection Nozzles, in fact all working parts of diesel locomotives can be cleaned faster, better and safer with Lix Diesel Klean Heavy.

Write, wire or phone for a representative to demonstrate in your shop. No obligation!

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

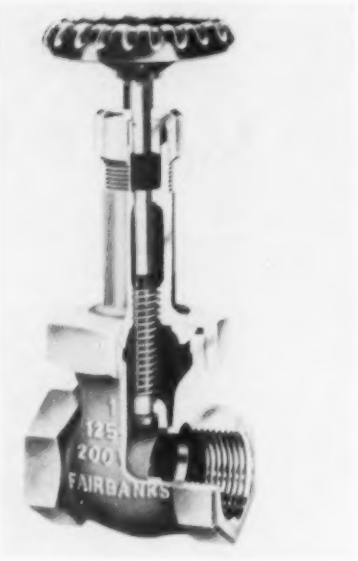
THE Lix PRODUCTS OF RESEARCH CORPORATION (OF MISSOURI)

716 EAST 85TH STREET, Dept. RL-4
KANSAS CITY, MISSOURI

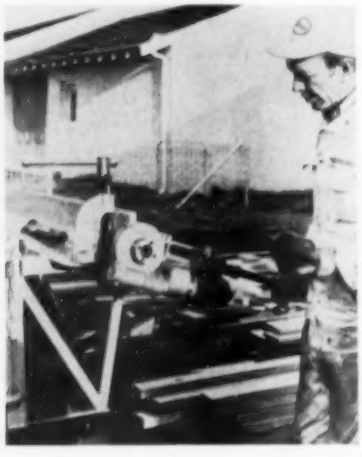
Leadership in Industrial Cleaning"

EQUIPMENT

(Continued from page 96)



sembly and to insure alignment of the working parts. It eliminates scoring of mating surfaces during assembly and provides even contact pressure. The valve may be repacked under pressure when wide open. The top seat is located above the stem threads and is out of the line of flow. Here it is protected against deposits and excessive wear. These valves are made in the 125 and 150 psi pressure classes. *Fairbanks Company, Dept. RLC, 393 Lafayette street, New York 3.*



Power Pipe Threader

The Lawco Junior portable power pipe threader weighs 20-lb and has a length of 27-in. It is driven with a ¾-hp electric motor controlled by a toggle switch that also reverses the motor. The unit is designed for one-hand operation, and with

400 New Hopper Cars Take the Rails for Western Maryland

A new fleet of triple-hopper cars, 400 in all, is now hauling coal for the progressive Western Maryland.

Designed by Bethlehem, these 70-ton (nominal capacity) units are typical of the modern trend in freight cars. They are equipped with multiple-wear wheels and roller bearings; Mayari R high-strength, low-alloy steel in heavier-than-normal gages was used in their construction. Features such as these contribute to safe, dependable service with reduced maintenance and repair costs.

The entire order of 400 hopper cars was built in the Bethlehem shops at Johnstown, Pa. It is an excellent example of what Bethlehem can furnish in open-top designs. For many years the nation's great carriers have come to Bethlehem for freight cars, and today we're equipped to do a bigger job than ever before. Just name the type of car you have in mind; we'll design it subject to your approval, or do the building to your own specifications.

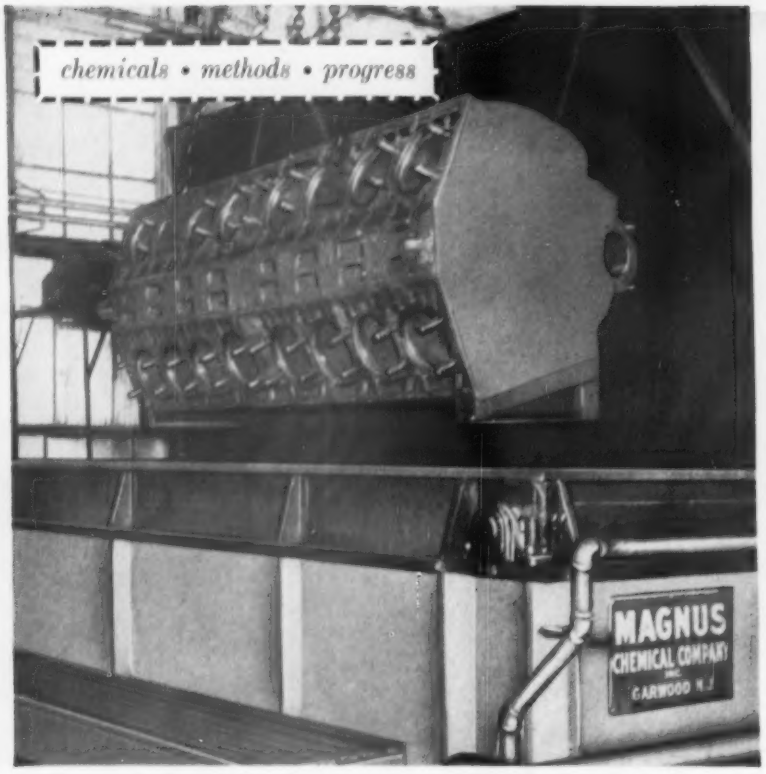
Seated at the table are the three Western Maryland representatives who inspected the first of the hopper cars at Bethlehem's Johnstown shops. They are, left to right, T. B. Davis, Master Car Builder; C. J. Wolfe, Superintendent Motive Power (signing acceptance papers); J. L. Triplett, Engineering Assistant to Superintendent Motive Power.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



5 Ton Diesel Block Cleaned in less than 90 minutes!

Fewer hours, better cleaning, easier handling at lower cost per job . . . these are the demands set forth by major railroads for the cleaning of 8, 12, and 16 cylinder blocks and bases.

Magnus, unlike any other company, manufactures both cleaning materials and equipment to work as a team, was able to come up with the answer to this problem.

The Magnus Aja-Dip machine cuts the cleaning time from six days to less than 90 minutes. Instead of requiring five men, it now takes only one. Instead of costing $360. per week using ineffective materials, with Magnus Super Strip and the Aja-Dip machine the cost per week was reduced to $145.

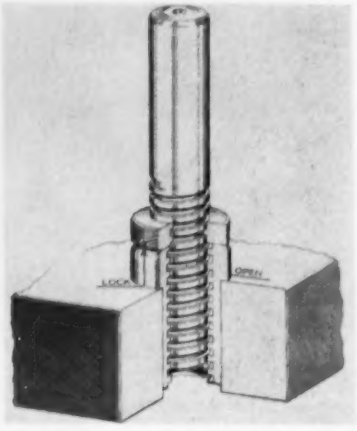
Find out how your shop can take advantage of the Magnus Method which pays off in dollars, time, and efficiency of cleaning.

Write to Magnus, 77 South Avenue, Garwood, N. J., for the latest issue of the complete 48-page Railroad Cleaning Manual.

magnus

RAILROAD DIVISION
MAGNUS CHEMICAL CO., INC.

adapters can thread pipe from ¼-in. to 10-in. In use, threading dies are applied to the Lawco tool, it is positioned, and the dies are driven through a speed reducer. It is claimed that the tool can also be used as an auger, for opening valves, for driving nuts and bolts, and as a hoist for weights up to 500-lb. *Velocity Power Tool Company, Dept. RLC, 201 North Braddock avenue, Pittsburgh.*



Removable Guide Pin

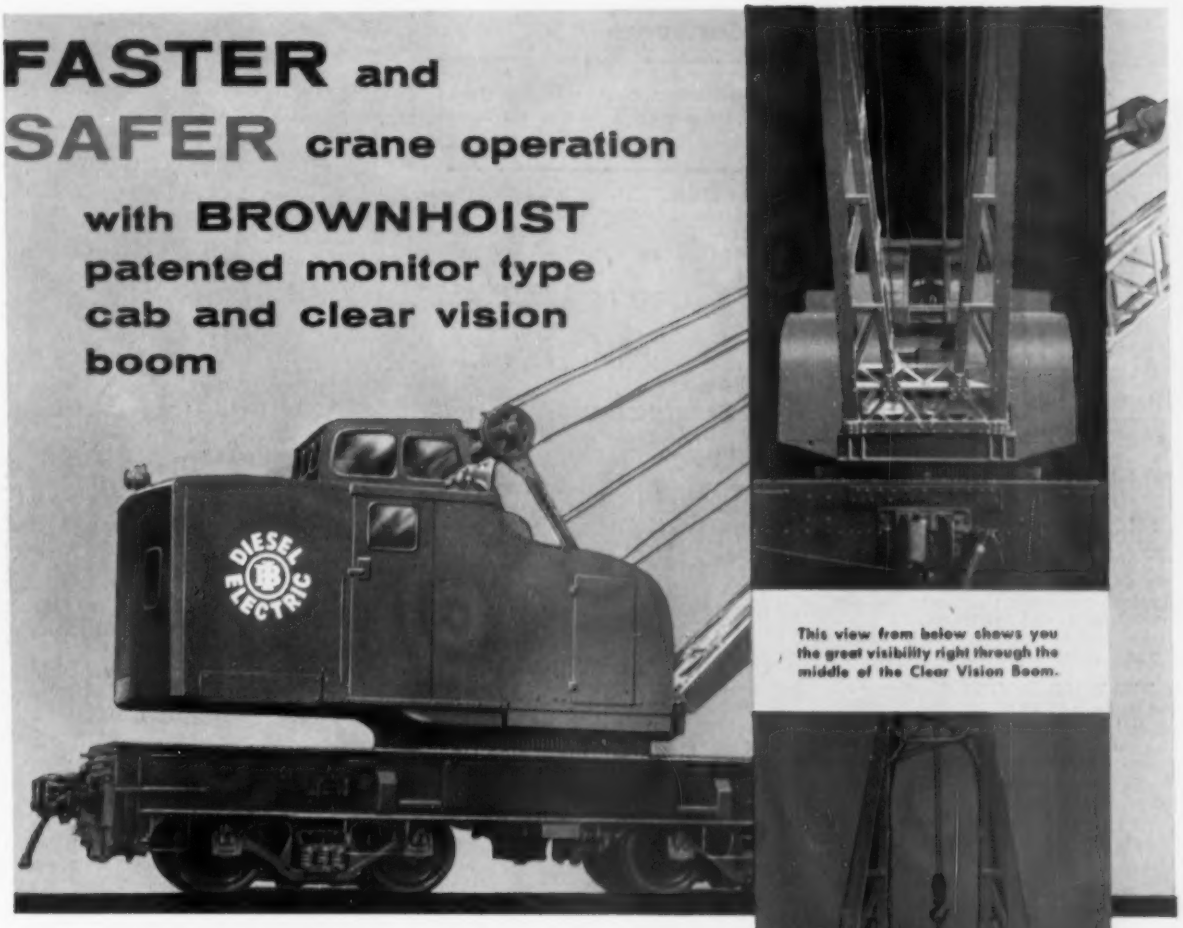
The Spira-Lock, a removable guide pin, permits easy variable adjustment to the shut height of the die. It is designed with a special threaded end to fit a threaded bushing. Adjustment to the die shut height is made by screwing the pin into the bushing to the desired height. With the pin at the proper height, it is pressed or driven down until the thread of the pin is press fit into the bushing thread. A lock nut on top of the bushing assures retention at all times.

Both pin and bushings are of hardened steel with a clearance of 0.0005 in. between the two components. Maximum rigidity is assured by utilizing the entire bearing surface of the bushing. Rigidity is further assured through use of a ground shoulder on the anchor bushing to maintain perfect squareness of the pin on the die shoe. The adjustable feature also eliminates cutting or grinding the tops of pins when removal of dies is necessary. No special tools are needed for installation or removal of the pins. *Superior Steel Products Corporation, Dept. RLC, Milwaukee.*

VPI Rust Inhibitor

To make VPI crystals, a rust inhibitor used in bulk by industry, available to small-quantity consumers, the material is now packaged in 2-oz shaker bags and 4-oz polyethylene spray bottles. The inhibitor is thus easily applied to any steel or aluminum surface which is to be kept free from corrosion. Tools and gages, recording and controlling instruments,

FASTER and SAFER crane operation with BROWNHOIST patented monitor type cab and clear vision boom



This view from below shows you the great visibility right through the middle of the Clear Vision Boom.

Windows on all sides of the raised Monitor Type Cab of a Brownhoist Locomotive Crane give the operator a full view of the area in which he is working, and the open type Clear Vision Boom lets him look right down at the work itself. This complete 360° visibility—to the sides, to the rear, and forward into the car—allows the operator to work more rapidly, without unnecessary crane swinging, and also increases safety by eliminating blind spots. The patented Monitor Type Cab has a door on each side, and all doors and windows can be opened for ventilation. A soundproof partition separates the operator from the engine and controls are placed within convenient reach of his adjustable seat. These factors assure ease of operation of the Brownhoist Locomotive Crane, and Brownhoist engineering assures maximum performance. Anti-friction bearings are used throughout including machinery side frames. The boom hoist is worm driven for smooth, safe operation. Dynamatic clutches disconnect all upperworks when travelling . . . give sure, positive control. High strength alloy steels bulwark the machine for heavy service. Throughout, Brownhoist Locomotive Cranes are designed and built for high capacity production. For further information write today for Catalog No. 548.

Approximate visibility from ordinary cab.
Approximate visibility from side-operated cab.
360° visibility from I. B. patented Monitor Type Cab.

Your operator can see exactly what he's working with in the car in front of him. Greater safety is the result.

188

BROWNHOIST MATERIALS HANDLING EQUIPMENT GIVES A LIFT TO AMERICAN INDUSTRY

INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Washington, Cleveland, Chicago, San Francisco, Montreal • AGENCIES: Detroit, Birmingham, Houston

SUBSIDIARY OF Penn-Texas

BROWNHOIST

Helps from Manufacturers

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

1. SPECIAL STEELS. 16-page booklet "Special Steels For Industry" gives details on stainless steels, electrical materials, Carmet carbide materials, and tool steels; includes charts and detailed data on fabrication and properties. (Write: *Sales Dept., Allegheny Ludlum Steel Corp., Dept. RLC, 2020 Oliver Bldg., Pittsburgh 22, Pa.*)

2. ALLIS-CHALMERS. 24-page pocket-size directory (B 6057) "This is A-C From A to Z" gives alphabetical description of company products and descriptive literature, includes brief history of Allis-Chalmers; lists locations of 17 plants, etc. (Write: *Allis-Chalmers Mfg. Co., Dept. RLC, 1251 S. 70th St., Milwaukee 1, Wis.*)

3. LUBRICANTS. 4-page 2-color catalog (103 A) "Fringe Area Lubrication With Molykote" lists 17 types of this molybdenum disulfide lubricant line and features complete data with diagrams; includes 5 new lubricants and selector charts. (Write: *Alpha Molykote Corp., Dept. RLC, 65 Harvard Ave., Stamford, Conn.*)

4. BEARING BRONZES. 6-page fan-fold bulletin (301) describes and gives physical properties of 5 to 9-in. diameter Asarcon 773 Continuous-Cast Bearing Bronze (SAE 660); in tabular form gives all stock sizes and weights of solid and hollow bronze bars. (Write: *Continuous-Cast Products Dept. American Smelting & Refining Co., Dept. RLC, Perth Amboy, N. J.*)

5. ZINC. 36-page catalog (AZI-31) "How Zinc Controls Corrosion" discusses and depicts the metallic zinc coatings, zinc pigments, and zinc anodes; includes numerous charts and tables, and photos show on-the-spot uses. (Write: *American Zinc Institute, Inc., Dept. RLC, 60 E. 42nd St., New York 17.*)

6. TOOL HOLDERS. 4-page punched catalog-folder (C.I.T. 9-55) describes, illustrates and gives specifications on Armstrong Armide Carbide Insert Tool Holders; includes seat prices. (Write: *Armstrong Bros. Tool Co., Dept. RLC, 5200-5300 W. Armstrong Ave., Chicago 30, Ill.*)

7. CEILING DIFFUSERS. 4-page 2-color catalog (F-7722) describes, illustrates and gives specifications on Venturi-Flo Model BP Ceiling Diffusers; includes performance data and physical characteristics. (Write: *Barber-Colman Co., Dept. RLC, Rockford, Ill.*)

8. CEMENTED CARBIDES. 68-page catalog (GT-310) "Carboloy Cemented Carbides For The Metal-Working Industry" gives most effective cutting speeds for carbide tools, machine tool horsepower requirements, how to determine shank size of single-point tools, carbide tool geometries, etc.; includes price and specification data on standard brazed carbide tools and accessories. (Write: *Carboloy Dept., General Electric, Dept. RLC, Detroit 32, Mich.*)

9. BELTS. 44-page fibre-board bound Dandux Belting catalog lists belts according to uses, includes separate section for each specific belt, photos show actual installations, data included on power transmission as added reference material. (Write: *C. R. Daniels, Inc., Daniels, Maryland.*)

10. CHEMICAL RUBBER. 8-page multi-colored booklet (A-509) "From Du Pont A New Engineering Material For Industry—Hypalon Synthetic Rubber" describes how to obtain rubber products with greater resistance to deterioration, and how Hypalon has solved numerous problems in product design and plant maintenance. (Write: *Elastomers Div., E. I. duPont de Nemours & Co., Dept. RLC, Wilmington 98, Delaware*)

11. PLASTIC LINING. 2-color bulletin (AD 152) "New From Garlock, a Super-Protective Lining Material Kel-F Plastic Laminate" describes, illustrates uses, lists properties and main advantages of this lining material ideal for inexpensive containers, tanks, pipes, surfacing for lab counter tops, floors, molds and rolls. (Write: *Garlock Packing Co., Dept. RLC, Palmyra, N. Y.*)

12. MOTORS & GENERATORS. Two 4-page specification sheets (GEC-1372) on Kinamatic Industrial Dripproof Direct-Current Motors and (GEC-1373) on Kinamatic Industrial Dripproof Direct-Current Generators; both contain cut-away drawings, data on application and performance. (Write: *Direct Current Motor & Generator Dept., General Electric, Dept. RLC, Erie, Pa.*)

13. CAST IRON WELDING. Illustrated 4-page 2-color booklet "Repair Cast Iron Parts Quickly & Easily With Ni-Rod and Ni-Rod 55" outlines welding of cast iron; includes nine graphic case histories showing welding electrodes in action. (Write: *Readers Service Section, International Nickel Co., Dept. RLC, 67 Wall St., New York 5.*)

14. STEEL FLOOR ARMOR. Illustrated booklet "Hexteel and Floorsteel Steel Floor Armor" describes the many uses of steel floor armor; shows application and installation of Hexteel heavy duty floor armor and Floorsteel flexible type floor armor with illustrations and engineering data. (Write: *Dept. KL(RLC), Klemp Metal Grating Corp., 6601 S. Melvina Ave., Chicago 38.*)

15. NATIONAL ELECTRIC. 20-page 2-color historical booklet "1905-1955, Fifty Years of Growth" discusses historical growth of National Electric, illustrates organizational setup and district offices are shown. (Write: *National Electric Products, Dept. RLC, Pittsburgh 22, Pa.*)

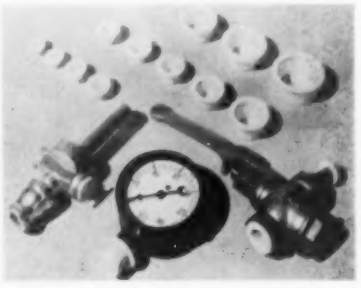
16. CRANKSHAFTS. 8-page 2-color broadside "Now You Can Regrind The Biggest Crankshafts With Speed and Accuracy" describes, illustrates, gives specifications and working diagrams on Van Norman Load Compensator used to maintain close tolerance in grinding extra long, extra heavy Railroad Diesel crankshafts. (Write: *Van Norman Automotive Equipment Co., Dept. RLC, Springfield 7, Mass.*)

17. VIBRATION MOUNTINGS. 8-page catalog (G-55) describes and illustrates the adaptability and versatility of the line of products for vibration control installations; includes chart for determining minimum deflection required for selected Vibration Isolation Efficiency. (Write: *Vibration Mountings Inc., Dept. RLC, 76-17 Queens Blvd., Elmhurst, N. Y.*)

sheet metal, switchgear, nuts and bolts are a few examples of items needing full-time or occasional rust protection.

When parts are to be stored, the use of bagged crystals is recommended. The bags are made of porous cotton so that slight shaking will cause some of the corrosion inhibitor to sift through onto the metal part. In some instances it may be easier to use the spray bottle for hard-to-reach areas.

Under normal conditions a 2-oz bag will protect equipment in a 30-cu ft enclosure for as much as two to three years. *Al-Con Chemical Company, Dept. RLC, P.O. Box 8168, New Orleans 22.*



Polyethylene Thread Protectors

These caps molded of Tenite polyethylene give threaded parts effective protection against dust, dirt and damage. They are said to serve either as caps over external threads in a machined part, or as plugs to protect internal threads, during assembly, shipment or storage. The resilient caps are made in lustrous green or yellow colors. They come in sizes and styles to fit all threads and openings. *Clover Industries, Inc., Dept. RLC, 528 Young street, Tonawanda, N. Y.*

Clamp

This revolving clamp assembly has been designed to hold down work during milling or drilling operations. The body is a malleable casting tumbled smooth and fitted with a knob screw that has a spring-lock revolving shoe on the end. The manufacturer states that this clamp provides positive hold-down on uneven surfaces. It

(*Continued on page 108*)

WELL CARED FOR—FROM COUPLER TO COUPLER

While boarding a train, have you ever stopped to admire the bright sheen of its painted surfaces and its sparkling clear windows? As you enter the car, spotless carpeting and clean rest rooms greet you. Here's well-cared-for equipment to lend comfort, convenience and confidence. Move up front to the diesel. Here again, cleanliness is very much in evidence. Everything from small electrical parts to filters and engine exteriors has been thoroughly cleaned. Chances are that the railroad is served by Dearborn.

But that's only part of the story.

Dearborn NO-OX-IDs keep rails, bridges, turnouts and crossings in safe operating condition. Other Dearborn products, such as cleaners, detergents, pressure cleaning systems, de-ionizing and Zeolite plants, and cooling water treatments for diesels, help to maintain "on time" operating schedules.

Dearborn is proud of its long record of service to America's railroads—a record that has made Dearborn a leader in its field for nearly 70 years.

Dearborn®

SERVING AMERICA'S RAILROADS SINCE 1887

DEARBORN RAILROAD SERVICES

NO-OX-ID® RUST PREVENTIVES—to protect metal surfaces against damage by corrosion.

DETERGENTS AND CLEANERS—to keep equipment clean—inside and out.

PRESSURE CLEANING SYSTEMS—to clean locomotives and cars—regardless of contour.

COOLING WATER TREATMENTS—for the protection of diesel engine cooling systems.

DE-IONIZING PLANTS—high purity water helps eliminate steam generator failures.

ZEOLITE PLANTS—to deliver soft water for steam generators and cooling systems.

DETAILED INFORMATION on any or all Dearborn services is available to you...just fill out and mail the coupon.

DEARBORN CHEMICAL COMPANY
Dept. RL, Merchandise Mart Plaza, Chicago 54, Ill.
Send information on:

- ☐ NO-OX-ID Rust Preventives
- ☐ Dearborn Cooling Water Treatments
- ☐ Dearborn Detergents and Cleaners
- ☐ Dearborn De-Ionizing Plants
- ☐ Dearborn Zeolite Plants
- ☐ Dearborn Pressure Cleaning Systems

Name.....*Title*.....

Railroad.....

Address.....

City.....*Zone*....*State*.....

PLUS these advantages:

LOW CONDUCTIVITY
Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity — .25 btu per square foot, per hour, per degree F., per inch thick.

LIGHT WEIGHT
Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.

PERMANENT
Does not disintegrate when wet, resists absorption. Will not shake down, is fire-resistant and odorless.

EASY TO INSTALL
Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.

COMPLETE RANGE
STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings are available.

HIGH SALVAGE VALUE
The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

Sudden and extreme temperature changes do not harm valuable perishables when they are shipped to market in cars insulated with dependable Streamlite HAIRINSUL.

Leading refrigerator car builders recognize this fact. That is why, for half a century, they have been specifying HAIRINSUL, the dependable all-hair insulation. They know it is the most efficient, most economical under ALL conditions . . . and that Streamlite HAIRINSUL weighs 40% less.

More reasons why refrigerator car builders prefer Streamlite HAIRINSUL are given at the left. There are more, too. Write for complete data.

AMERICAN HAIR & FELT COMPANY
Merchandise Mart • Chicago, Illinois

SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED.

TOP CYLINDER LINER WEAR ONLY .0075 AFTER 796,000 MILES WITH AIR-MAZE OIL BATH AIR FILTER

Photograph shows type of engine and filter assembly used by this railroad to cut ring and cylinder liner wear.

LOOKING for a way to lick excessive ring wear on its diesels, a leading midwestern railroad* equipped one of its road passenger units with an Air-Maze oil bath air filter. 796,000 miles later, inspection of one of the original power assemblies revealed that top (not average) cylinder liner wear was only .0075 inch. The ferrox indicating grooves were visible over the entire periphery of every compression ring. And analysis of air box deposits revealed only .20% silica content as compared with the usual 5-10%.

Result: The railroad was able to extend power assembly component life to well past the former maintenance schedule.

Air-Maze oil bath air filters not only do a better filtering job, they also reduce filter maintenance. Up to 3 months without servicing—up to 24 times as long as panel-type filters! And because they save on both engine *and* filter maintenance, they pay for themselves in less than a year.

Air-Maze oil bath filters clean air thoroughly because they scrub air in a bath of oil. And an oil-washed screen traps any remaining dust, passing only clean, oil-free air. For further information, call on us. The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

*Name on request. Please write on your business letterhead.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
Electromotive	800-900	Switcher	Alco-GE	2250	Rd. Switch
Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1200	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
Alco-GE	1500-1600	Rd. Switch	F-M	2400	Trainmaster
Alco-GE	1500-1600	Rd. Freight			

AIR-MAZE The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

HARDENED and GROUND for LONGER wear

EX-CELL-O PINS AND BUSHINGS

Keep your equipment out of the shop and on the rails with Ex-Cell-O steel pins and bushings. They give from four to six times longer service than ordinary pins and bushings. The tough ductile core of Ex-Cell-O pins and bushings withstands shocks, vibration; their hard case and fine finish resist abrasive action.

52-29

Standard styles and sizes of Ex-Cell-O pins and bushings for steam, Diesel, and passenger car equipment are given in the new Ex-Cell-O Bulletin 32559. Write today for your copy.

RAILROAD DIVISION
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

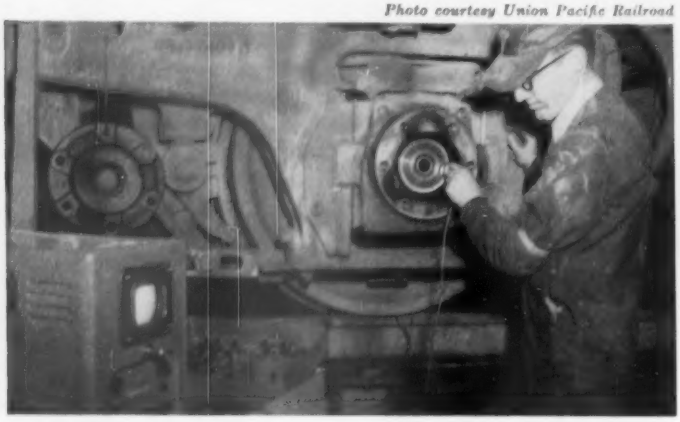
REFLECTOSCOPE TEST BULLETIN

Sperry

Sperry

Combination of Wheel-Truing and ULTRASONIC INSPECTION Cuts Maintenance Costs—Improves Safety

Photo courtesy Union Pacific Railroad



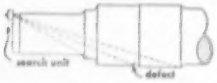
Modern wheel-truing machines make it possible to restore wheel-tread contour without pulling the wheels and axle from under the locomotive.

Periodic wheel maintenance can be performed more quickly and at lower cost with this new equipment. However, such procedure eliminates the opportunity for usual inspection of axles by magnetic particle or similar visual methods, which require axle removal.

Regular inspection of diesel axles is more important today than ever before. Higher speeds and heavier loads accelerate fatigue failure, place increased emphasis on safety and the importance of a *complete* maintenance program. The problem is how to inspect axles in a periodic maintenance schedule which no longer requires their removal from the engine.

Reflectoscope inspection supplies the answer: Accurately testing axles *under the engine* in a matter of minutes, the Reflectoscope has proved an ideal working partner to the wheel-truing machine. While the locomotive is on the wheel-truing machine, a Reflectoscope inspection is made of each axle. Any defective axles are located by the Reflectoscope. Adequate periodic inspection of vital components is assured. Only sound units leave the shop.

How it Works



For diesel axle testing, special "Angle-Beam" Search Units are used. These units project ultrasonic inspection beams at an angle instead of in a straight line. Angle-beam search permits testing of fillets and similar critical axle areas which cannot be inspected with a straight search unit.

A visual picture of any defect and its location in the material appear on the Reflectoscope screen. The instrument tests "in place" without disassembly. Procedures are simple – results positive and immediate.

Mechanical Departments will find that Sperry Rail Service offers the most advanced nondestructive inspection equipment yet developed for practical railroad applications. For complete information return the attached coupon.

Sperry

SPERRY RAIL SERVICE
Division of Sperry Products, Inc.
Danbury, Connecticut

Send details of Ultrasonic inspection for railroad equipment.

Name_____ Title_____

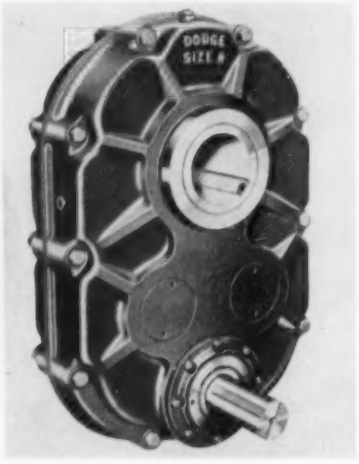
Address_____

City_____ State_____

EQUIPMENT

(Continued from page 104)

is applied to machine tools by drilling and tapping one hole for the mounting stud. The clamp is designed to swing clear of the work and fixture when not in use. Three sizes are produced. *Jergens Tool Specialty Company, Dept. RLC, 712 E. 163rd street, Cleveland.*



Shaft-Mounted Speed Reducers

Two models of shaft-mounted speed reducers have been added to the line of Torque-Arm units. Model No. 8, in the double reduction series, has a capacity of 60 hp at 100 rpm, AGMA rating, and can be mounted on shafts up to 5 in. diameter. Model No. 11 has a capacity of 1.3 hp at 100 rpm.

No foundation, no flexible couplings, no sliding base is needed for these speed reducers. The reducers are mounted directly on the shaft, and the Torque-Arm is fastened to any fixed object, anchoring the unit. It is driven through a V-belt drive, and taper-lock sheaves permit any speed ratio desired.

A Tri-Matic overload release, which loosens the belts, cuts off power and gives a warning in case of excessive load is available for use with either of the two speed reducers. A built-in backstop may also be had when conditions require a device to prevent the reversal of direction of rotation. *Dodge Manufacturing Corporation, Dept. RLC, Mishawaka, Ind.*

Transformer Spray Nozzle

The Model T-1 spray nozzle for the protection of transformers has been tested and approved by the Factory Mutual Laboratories. According to specifications it is

THE PERFECT CLEANER

F.O.-128

(low toxicity—high flash)

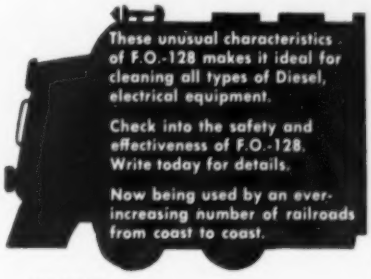
for all DIESEL ELECTRICAL EQUIPMENT

FINE ORGANICS
'SAFE-TEE'
SOLVENTS

F.O.-128 does away with carbon tetrachloride and all other cleaners that may be a health hazard to personnel.

F.O.-128 increases cleaning and degreasing efficiency — does away with excessive maintenance costs, motor failures and wasted man hours.

- *zero residue on drying*
- *fifteen times more safe than carbon tetrachloride*
- *will not attack insulations*
- *non-corrosive*
- *will not produce dermatitis*



These unusual characteristics of F.O.-128 makes it ideal for cleaning all types of Diesel, electrical equipment.

Check into the safety and effectiveness of F.O.-128. Write today for details.

Now being used by an ever-increasing number of railroads from coast to coast.

Also Available—
F.O.-102 and F.O.-162—Carbon Removers
F.O.-106 and F.O.-116—Emulsion Cleaners

Our representative will be glad to call upon request. Write to Dept. '3'.

FINE ORGANICS, Inc.
211 East 19th St. · New York 3, N. Y.

possible, with only four nozzles per transformer, to isolate or extinguish a transformer fire before it spreads to other equipment. Formerly, many nozzles and a costly installation were required.

The nozzles deliver approximately 80 gpm at 25 psi with a driving 80 deg full-cone spray pattern suited to outside work under all weather conditions. All passages are said to be large and non-clogging. The unit, of cast bronze, has a 2-in. female pipe thread. *Bete Fog Nozzle, Inc., Dept. RLC, 309 Wells street, Greenfield, Mass.*

Filter Housings

These Series QS housings have been designed for high capacity diesel full flow lube systems. Features are said to be easy maintenance, effective micronic filtration, high flow rates and low cartridge replacement cost. Its quick opening cover can be operated for fast and easy cartridge changes. One man can simply drop the

(Continued on page 112)

Popular Champ for **Heavy Duty** Service

STRATOFLEX "215"

INDUSTRIAL HOSE AND FITTINGS

Super resistance to abrasion and corrosion makes this hose excellent for railroads, road equipment, farm machinery, and materials handling equipment. High tensile strength single wire braid. Tough synthetic rubber cover. Working pressures to 2500 psi. Bulk hose and fittings . . . complete hose assemblies at your dealer.

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Dealerships open in some areas.

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STRATOFLEX, INC. FORT WORTH, TEXAS
P. O. BOX 10398

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SALES OFFICES
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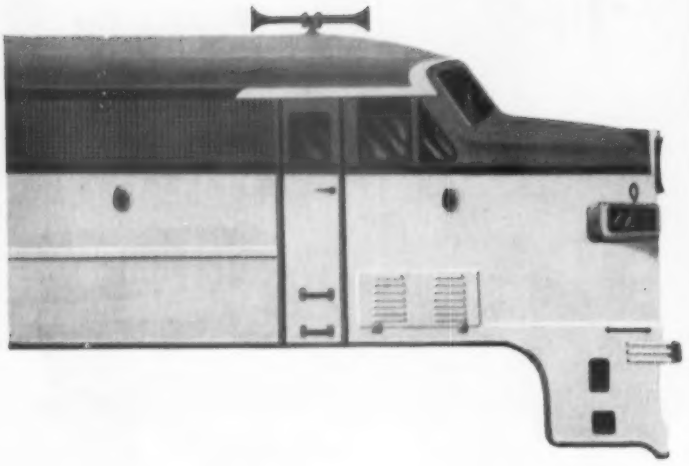
IN CANADA
STRATOFLEX OF CANADA, INC. TORONTO 18, ONTARIO

Unbeatable diesel-cleaning team



Above the running gear—

PENNSALT PEN-GLEAM

PEN-GLEAM® can be used regularly on diesel locomotive exteriors to cut stubborn road film without damaging painted or metal surfaces. Applied either manually or with spray washers, in hot or cold water, PEN-GLEAM puts the gleam back on locomotive and car exteriors but *doesn't corrode while it cleans.*

For grimy running gear—

PENNSALT CLEANER "50"

PENNSALT® CLEANER "50" goes after the *really tough* soils picked up by trucks, underframes, wheels, and oil tanks. You get a higher percentage of cleaned running gear with Pennsalt "50" than with any other heavy-duty cleaner. Balanced alkalinity combined with penetrating wetting agents gives "50" a cleaning ability never before seen for toughest diesel maintenance.

Chemical Progress Week April 23-28

ASK YOUR PENNSALT MAN about PEN-GLEAM and "50", or write Metal Processing Dept. 283, Pennsylvania Salt Manufacturing Co. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, California. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

Charm your hose

with PUNCH-LOK Hose Clamps

Air Tool Hose

Wrapped Insulation on Piping and Tubing

Tank Hose

Punch-Lok hose clamps are ideal for use on all types of shop hose—for repairs or for original installations. They are widely used by makers of diesel engines in new construction and for engine overhaul jobs. Punch-Lok hose clamps have a well earned reputation for safety and dependability.

"The Sign of a GOOD Hose Clamp"

Write direct for catalog and prices.

PUNCH-LOK Company

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Dept. N, 321 North Justine Street, Chicago 7, Ill.

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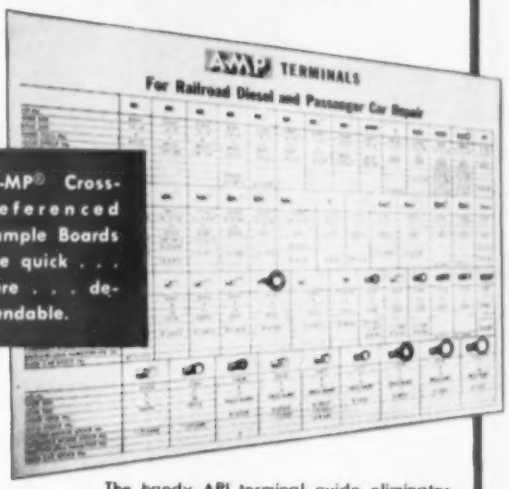
SIMPLE



A-MP® Cross-Referenced Sample Boards are quick . . . sure . . . dependable.

The handy API terminal guide eliminates errors in applications. One quick glance shows you the O.E.M. part number, the railroad part number, the correct tooling required and the API part number.

Make sure the latest edition of the A-MP Sample Board is displayed in all Diesel passenger-car and electrical repair shops.

API branch warehouses stock all popular A-MP terminals and tools for railroad maintenance and repair. Contact your local API office.

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FRAHM® and JAGABI®
Speed Measuring Instruments
. . . to meet every requirement
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MEGGER®
Electrical Resistance
Measuring Instruments
. . . for all electric, Diesel-electric locomotives and other electrical equipment testing requirements.
Write for File RR #1

BE SURE YOU'RE ON THE RIGHT TRACK
ALWAYS SPECIFY

EQUIPMENT *(Continued from page 109)*

swing bolts, lift the cover arm, swing the cover aside and remove the cartridges.

Cartridges used in the housings are produced for high dirt holding capacity and long life. Degrees of filtration are 5, 10, 25 or 50 microns. Flow capacity for the largest unit is 500 gpm of clean oil at 150 SSU, 25 micron filtration and with a pressure drop of 2 psi. Smallest unit handles 80 gpm under the same conditions.

The manufacturer recommends for effective filtration that this filter housing be preceded by an Auto-Klean unit on full flow applications. By use of this unit, oversized contaminants are removed before flowing to the QS unit. When conditions warrant, an external by-pass with sight glass should be installed around the cartridge filter. *Cuno Engineering Corporation, Dept. RLC, Meriden, Conn.*

Plastic Laminate Lining

This lining material is a laminate of Kel-F plastic that has been fused and flowed into a glass fiber cloth backing. It can be applied to inexpensive containers, tanks, pipes, etc. Conventional adhesives can be used to apply the laminate to practically any contoured surface and it can be applied to large tanks and vessels right on the job.

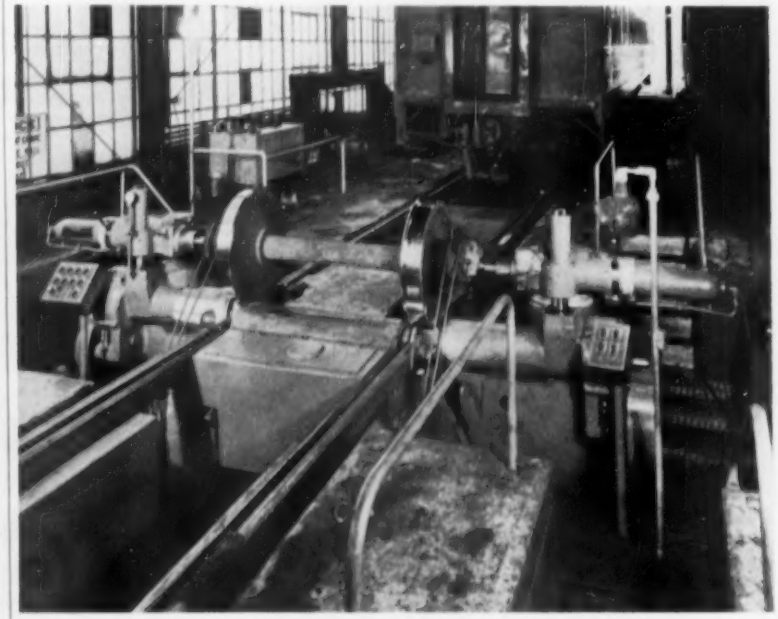
Physical characteristics of the laminate include extreme chemical resistance to acids, alkalies, oxidants, and solvents. It is non-toxic, has high abrasion resistance, tensile strength, dielectric strength, electrical resistivity; high and low temperature resistance, non-wetting surface, low temperature flexibility and is non-sticking. *Garlock Packing Company, Dept. RLC, Palmyra, N.Y.*

300 Watt Floodlamp

A 300 watt PAR-56 floodlamp, producing a controlled beam substantially rectangular in pattern, is a companion to the previously listed spot and floodlamps. All three are precision made for a wide range of applications.

The newest addition has an approximate initial mean candlepower rating of 10,000 in the central cone and an approximate initial beam lumens in cone to 10 per cent maximum candlepower of 2,300 lumens. It has a beam spread of 30 by 60 deg and a rated life of 2,000 hr.

These lamps, with good maintenance of light output and a minimum of cleaning, are adaptable for lighting of railroad yards where high candlepower per watt make them effective at the long distances involved. They can also be used for the lighting of entrances, signs, buildings, etc. *Large Lamp Department, General Electric Company, Dept. RLC, Schenectady 5, N.Y.*



A single pair of mounted wheels can now be recontoured on the wheel truing machine manufactured by the Standard Railway Equipment Mfg. Co., Dept. RLC, 310 S. Michigan ave., Chicago 4. The additional function of the machine is made possible by an adapter kit which is available for machines now in use and is standard on the present production models. The adapter consists of a tie-down arrangement which passes over each journal through guide rollers to hydraulic pull-down cylinders in the bottom of the pit. Idler rollers have replaced the jacking blocks behind the wheels and require but one or two minutes to set in place compared to 15 min. for the jacking blocks. Total set-up time for a pair of wheels, either loose or installed in a truck, has been reduced from 20 min to 10 min.

AIR-PUSH Jumbo Rotary-Seal
WINDSHIELD WIPERS

POWER . . . when you need it most!

The economical Air-Push motors have the extra power needed to wipe the larger windshields used on late model locomotives.

Air-Push motors offer: INSTANT STARTING, MORE POWER, LOWER MAINTENANCE COSTS, RUGGED CONSTRUCTION, COMPLETELY REPLACEABLE PARTS . . . that's why Air-Push equipment is used on more than 90% of all diesel operated locomotives.

DON'T BUY A NEW MOTOR — Send your old one to the factory for a warranted major overhaul — at ½ the cost of a new one.

Send TODAY for details!

Make On-The-Job MINOR REPAIRS with the Air-Push REPAIR KITS

Sprague DEVICES, INC.,
MICHIGAN CITY, INDIANA, U.S.A.

How Metallizing saves money in railroad shops

"Cold" metal build-up helps beat skyrocketing replacement costs—speeds maintenance jobs

Typical Railroad Metallizing Applications

Engine crankshafts, mains, throws, fits • Engine cylinders, liners, liner flutes • Water jackets, camshaft bearings • Generator, traction motor, other armature shaft bearing fits • Compressor crankshafts • Traction motor end housings • Pump rods and shafts • Eroded or corroded portions of engine blocks • Car lighting generator pulleys • Dents and scratches in car bodies

—practically any worn part repaired at only 15 to 20% replacement cost—get equipment back in service in hours, instead of days or weeks.

Some of the 28 major railroads using Metallizing:

A.T. & S.F.	Missouri Pacific	Baltimore & Ohio
New York Central	Northern Pacific	Canadian National
Atlantic Coast Line	Pennsylvania	Chesapeake & Ohio

SPECIAL RAILROAD BULLETIN AVAILABLE—Illustrates and describes a number of these time-saving, money-saving metallizing applications. Data supplied by railroads using metallizing; photographs taken in user shops. Write for copy.

METCO

Metallizing Engineering Co., Inc.
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In Great Britain: Telephone: EDGEWOOD 4-1300
METALLIZING EQUIPMENT COMPANY, LTD.—Chobham near Woking, England

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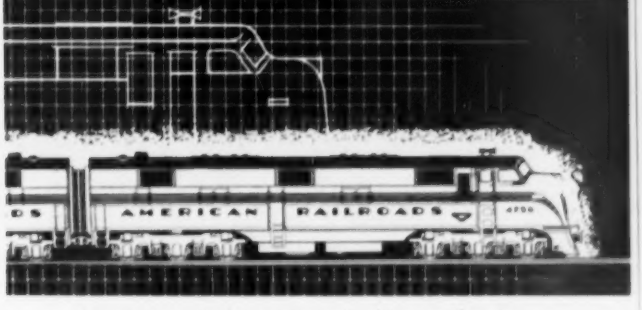
proven fact
TIME AND MONEY ARE BEING SAVED BY USERS OF DEMP-NOCK
SPRAY IT - STENCILS



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TRANSALL® Flange Lubricator* and Lubricating Sticks*

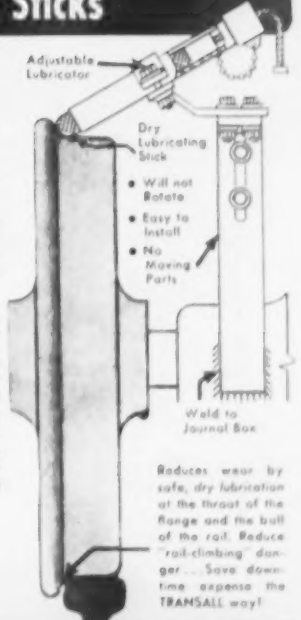
Can Reduce Your Wheel Maintenance Costs Up To 50%

On *all* rolling stock—passenger, switch, or mine locomotives, overhead cranes, rotary kilns—wherever there is wheel flange *wear*, TRANSALL'S *dry* Lubricating Sticks provide effective lubrication, reduce wear, and lower maintenance costs.

TRANSALL'S new *dry* lubricant remains on the wheel flange; will not creep across tread to cause slippage; will not pick up sand; and is unaffected by water and temperature changes. The non-rotating, *square* stick lubricates the *entire* flange wear area.

Investigate the TRANSALL way to save on wheel maintenance. Write or wire for complete information now.

*Patents Pending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Dry Lubricating Stick
• Will not Rotate
• Easy to Install
• No Moving Parts
Weld to Journal Box
Reduces wear by safe, dry lubrication at the throat of the flange and the butt of the rail. Reduce "rail-climbing" danger . . . Save down-time expense the TRANSALL way!

TRANSALL® INC.
RAILWAY DIVISION
109 No. 11th Street • P.O. Box 1588 • BIRMINGHAM, ALA.

FLUSH FIT MOISTURE TIGHT..

...WITHOUT COUNTERSINKING

All products manufactured in the U.S.A. to A.S.T.M. specification.

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Each Lewis Sealtite car bolt has special "wood engineering" beveled head for flush, moisture tight, fit . . . without countersinking. Standard and large-head car bolts have patented fins that grip wood, prevent turning . . . slotted head bolt can be set with screwdriver. Available in Hot-Dip galvanized finish for "Long Life Economy," in black for low first cost. Call, write or wire for sample prices.

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American Brake Shoe Co., National Bearing Division 84, 85
Agency—Fuller & Smith & Ross, Inc.

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Agency—Oscar P. Holtzman Advertising

American Steel Foundries 4, 5
Agency—Erwin, Wasey & Co., Ltd.

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Agency—Jones & Brakeley

Biddle Co., James G. 112
Agency—The Rolland GE Ullman Organization

Buckeye Steel Castings Co., The 25
Agency—T. J. Stead, Advertising

Buffalo Brake Beam Company Inside Front Cover

C & D Batteries, Inc. 94
Agency—John T. Halland Co.

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Agency—Leap Orr Co.

Climax Molybdenum Company 90, 91
Agency—G. M. Basford Company

Crane Packing Company 93
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Agency—Clifford A. Kroening, Inc.

Dearborn Chemical Company 105
Agency—The Buchen Company

Demp-Nock Co., The 113

Dow Chemical Company, The 75
Agency—MacManus, John & Adams, Inc.

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Agency—Bond & Starr, Inc.

Electro-Motive Division, General Motors 30, 31
Agency—Kudner Agency, Inc.

Esso Standard Oil Company 40
Agency—McCann-Erickson, Inc.

Ex-Cell-O Corporation 107
Agency—Holden, Chapin Laruc, Inc.

Exide Industrial Division-Electric Storage Battery Co., The 20
Agency—Gray & Rogers

Fairbanks, Morse & Co. 79
Agency—The Buchen Company

Fine Organics, Inc. 109
Agency—Kermin-Thall

General Electric Co. 12, 13, 26, 27, 82, 83
Agency—G. M. Basford Company

General Steel Castings 97
Agency—Oakleigh R. French & Assoc.

Gould-National Batteries, Inc. 24
Agency—Hutchins Adv. Co., Inc.

Gulf Oil Corporation 23
Agency—Young & Rubicam, Inc.

Hyatt Bearings Division of General Motors 8, 9
Agency—D. P. Brother & Co., Inc.

Industrial Brownhoist Corporation 103
Agency—Price, Tanner & Willox, Inc.

Ingersoll-Rand 17
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.

International Nickel Company, Inc., The 28
Agency—Marschalk & Pratt Co., Inc., Div. of McCann-Erickson, Inc.

International Steel Company 80
Agency—W. S. Kirkland Advertising

Joy Manufacturing Company 11
Agency—Walker & Downing

Lewis Bolt & Nut Company 114
Agency—E. T. Holmgren, Inc.

Linde Air Products Company, a Division of Union Carbide and Carbon Corporation 73
Agency—J. M. Mathes, Inc.

Lix Corporation, The 100
Agency—Walter J. Johnson, Associates

Mangus Chemical Co., Inc. 102
Agency—Brudno & Bailey

Magnus Metal Corporation 71
Agency—Marsteller, Rickard, Gebhardt, & Reed, Inc.

Metallizing Engineering Co., Inc. 113
Agency—The Schuyler Hopper Company

Met-L-Wood Corporation 92
Agency—Armstrong Advertising Agency

National Bearing Division, American Brake Shoe Co. 84, 85
Agency—Fuller & Smith & Ross, Inc.

National Carbon Company, A Division of Union Carbide and Carbon Corporation 39
Agency—William Esty & Co.

National Electric Coil Company Inside Back Cover
Agency—Kight Advertising, Inc.

National Malleable and Steel Castings Company 42
Agency—Palm & Patterson, Inc.

Oakite Products, Inc. 1
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.

Pennsylvania Salt Mfg. Co. 110
Agency—Geare-Marston, Inc.

Pullman-Standard Car Manufacturing Company 33-36
Agency—Fuller & Smith & Ross, Inc.

Punch-Lok Company 111
Agency—Merrill & McEnroe & Assoc., Inc.

Rust-Oleum Corporation 21
Agency—O'Grady, Andersen & Gray, Inc.

Shell Oil Company 89
Agency—J. Walter Thompson Company

Simplex Wire & Cable Co. 98
Agency—Henry A. Loudan, Inc.

Speer Carbon Co. 38
Agency—Hazard Advertising Company

Sperry Rail Service, Division of Sperry Products 108
Agency—Hazard Advertising Company

Sprague Devices, Inc. 113
Agency—Paul L. Brown & Associates

Standard Car Truck Company 95
Agency—Stuart Potter Co.

Standard Oil Company of California 37
Agency—Batten, Barton, Durstine & Osborn, Inc.

Stratoflex, Inc. 109
Agency—Magnussen & Teague

Timken Roller Bearing Company, The Back Cover
Agency—Batten, Barton, Durstine & Osborn, Inc.

Transall, Inc. 113
Agency—Robert Luckie & Company

Tureo Products, Inc. 7
Agency—Van der Boom Hunt McNaughton, Inc.

Uni-Pak Corporation 99

United States Rubber Company 15
Agency—Fletcher D. Richards, Inc.

Waugh Equipment Company 77

Westinghouse Air Brake Company 2
Agency—Batten, Barton, Durstine & Osborn, Inc.

Wine Railway Appliance Co., The Front Cover
Agency—T. J. Stead, Advertising

Wix Corporation 32
Agency—Humbert & Jones

Wyandotte Chemicals Corporation 86, 87
Agency—Brooke, Smith, French & Dorrance, Inc.

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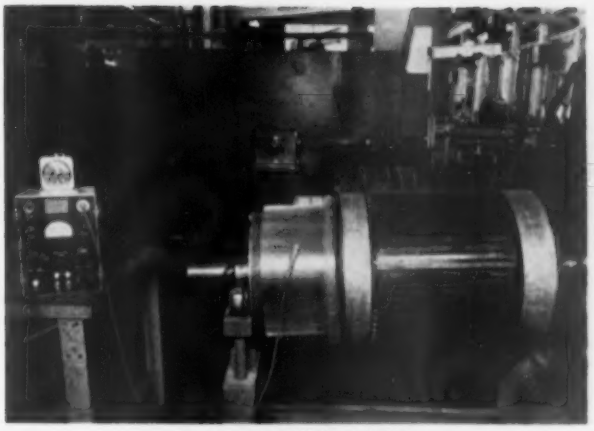
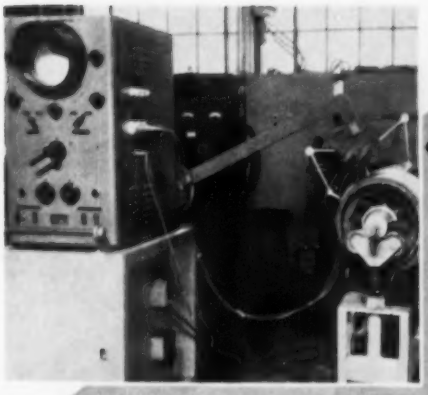
These tests insure the consistent high quality of National traction motor rewinding...



D. C. GROUND TEST

Excess leakage on the D. C. ground test indicates questionable ground insulation, inadequate cleaning, an insufficient baking cycle or an improperly conditioned winding.



SURGE COMPARISON TEST

This test simultaneously stresses the ground and turn insulation in a manner similar to that encountered when a flashover occurs in service. Weak turn insulation is immediately revealed by the application of the controlled surge voltage.

A. C. GROUND TEST

In accordance with accepted practice, all armature windings are given a standard AIEE one-minute A. C. ground test.

DUCTER TEST

A low resistance ohmmeter capable of measuring resistance of .000001 of an ohm is used to locate possible high resistance connections by measuring the resistance between adjacent bars.

BAR-TO-BAR TEST

Shorted bars, whether caused by a short-circuited turn or by the presence of copper dust between adjacent bars, are quickly located with the electronic armature bar-to-bar tester.

Complete and careful testing is only one of the reasons why National should be your first source for traction motor rewinding. For the complete story, call your nearby National field engineer. If you don't know him, just drop us a line.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

"ROLLER FREIGHT" IS ROLLING!

In 1955 alone: 31 railroads and private car owners have ordered TIMKEN® roller bearings for 6441 more freight cars—1813 of them to be used in general interchange

HERE ARE SOME OF THE RECENT "ROLLER FREIGHT" ORDERS:

Another "Roller Freight" Flash

ATLANTIC COAST LINE ADDS 651 50-TON "ROLLER FREIGHT" HOPPER CARS TO SPEED SHIPMENTS

Another "Roller Freight" Flash

WESTERN PACIFIC IS LATEST RAILROAD TO GO "ROLLER FREIGHT" WITH 50 NEW FLAT CARS ON TIMKEN BEARINGS

Another "Roller Freight" Flash

FRISCO IS NEWEST ROAD TO GO "ROLLER FREIGHT" WITH 200 NEW CARS ON TIMKEN BEARINGS

Another "Roller Freight" Flash

NEW HAVEN TO PUT 400 NEW "ROLLER FREIGHT" BOX CARS IN INTERCHANGE SERVICE

Another "Roller Freight" Flash

NOW, IT'S ALASKA RAILROAD GOING "ROLLER FREIGHT" WITH 100 COAL BALLAST CARS

Another "Roller Freight" Flash

QUEBEC, NORTH SHORE AND LABRADOR RAILROAD ORDERS 650 MORE "ROLLER FREIGHT" CARS FOR TOTAL OF 2877

Another "Roller Freight" Flash

NOW IT'S THE LOUISIANA AND ARKANSAS GOING "ROLLER FREIGHT" WITH 75 NEW HOPPER CARS TO SPEED SHIPMENTS

Another "Roller Freight" Flash

BOSTON AND MAINE ORDERS 800 NEW "ROLLER FREIGHT" BOX CARS FOR INTERCHANGE SERVICE

Another "Roller Freight" Flash

NOW, IT'S THE SOUTHERN THAT'S GOING "ROLLER FREIGHT" WITH 260 NEW CARS ON TIMKEN BEARINGS

Another "Roller Freight" Flash

PENNSY GOES "ROLLER FREIGHT" WITH 148 70-TON FLAT CARS FOR NEW PIGGYBACK SERVICE

Another "Roller Freight" Flash

READING JOINS GROWING LIST OF RAILROADS GOING "ROLLER FREIGHT" —WITH 50 NEW CARS ON TIMKEN BEARINGS

Another "Roller Freight" Flash

NORTHERN PACIFIC ADDS 100 "ROLLER FREIGHT" REEFERS TO

Another "Roller Freight" Flash

SANTA FE ORDERS 200 NEW "ROLLER FREIGHT" REEFERS TO SPEED SHIPMENTS

Another "Roller Freight" Flash

WESTERN MARYLAND TO SPEED SHIPMENTS WITH 400 MORE "ROLLER FREIGHT" CARS

Another "Roller Freight" Flash

CHICAGO GREAT WESTERN TO SPEED SERVICE BY ADDING 80 MORE "ROLLER FREIGHT" CARS

Another "Roller Freight" Flash

GREAT NORTHERN ORDERS 200 BOX CARS ON TIMKEN BEARINGS FOR INTERCHANGE SERVICE, DOUBLES ITS "ROLLER FREIGHT" ROLLING STOCK

CAR by car, train by train, more and more railroads are making the switch to "Roller Freight" by ordering freight cars equipped with Timken® tapered roller bearings. Since the start of last year, "Roller Freight" has been gaining momentum at the rate of more than 17 cars a day. Orders in 1955 exceeded the previous five years combined.

By putting Timken bearings on freight cars, the railroads are realizing important operating economies, largely through the reduction of hot boxes and inspection costs, and are taking a big step forward in bringing better service to their shippers. And 1813 cars, owned by seven of these railroads, are being placed in general interchange.

The switch is really on! The day is drawing nearer when all railroads will enjoy the benefits of "Roller Freight" and will save millions of dollars per year in operating costs. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

BOX SCORE TO DATE OF ALL RAILROADS WITH 20 OR MORE "ROLLER FREIGHT" CARS

AKRON, CANTON & YOUNGSTOWN
ALASKA RAILROAD
ATCHISON, TOPEKA & SANTA FE
ATLANTIC COAST LINE
BALTIMORE & OHIO
BOSTON AND MAINE
CHESAPEAKE & OHIO
CHICAGO, BURLINGTON & QUINCY
CHICAGO GREAT WESTERN
DULUTH, MISSABE & IRON RANGE
ERIE
GREAT NORTHERN
LOUISIANA AND ARKANSAS
NICKEL PLATE ROAD
NEW HAVEN
NORTHERN PACIFIC
PENNSYLVANIA
QUEBEC, NORTH SHORE & LABRADOR
READING
ST. LOUIS—SAN FRANCISCO
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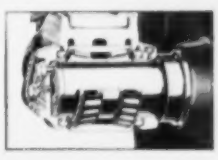
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